DOCUMENT RESUME

ED 068 019 HE 003 460

TITLE	Some Problems of the Development of Higher Education in Europe.
INSTITUTION	Ministry of Education and Cultural Affairs (Belgium).; Organisation for Economic Cooperation and Development, Paris (France). Directorate for Scientific Affairs.
PUB DATE	69
NOTE	409p.
EDRS PRICE	MF-$0.65 HC-$16.45
DESCRIPTORS	*Educational Change; Educational Finance; *Educational Planning; *Enrollment Trends; Financial Problems; *Higher Education; *International Education; Manpower Needs

ABSTRACT

This publication is an account of a Seminar on the Development of Higher Education which was organized and financed conjointly by the Belgian Ministry of Education and Cultural Affairs and the Directorate for Scientific Affairs of the Organization for Economic Co-operation and Development. Presentations at the seminar centered around the problems of long-term development of higher education; the structural reforms in higher education; methods of forecasting the number of students; forecasts of manpower requirements; and the cost and financing of higher education. (HS)

N- 10
HE

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

DAS/EID/69.27

FOR GENERAL DISTRIBUTION
PARIS, September 1969

ED 068019

DIRECTORATE FOR SCIENTIFIC AFFAIRS

SOME PROBLEMS OF THE DEVELOPMENT OF HIGHER EDUCATION IN EUROPE

HE 002 460

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
OFFICE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY

ED 068019

ORGANISATION FOR ECONOMIC
CO-OPERATION AND DEVELOPMENT

FOR GENERAL DISTRIBUTION

Paris, September 1969.

DAS/EID/69.27

Or. Engl./Fr.

DIRECTORATE FOR SCIENTIFIC AFFAIRS

Some Problems of the Development of Higher Education in Europe

Conference papers and report of sessions at the seminar organised jointly, by the Belgian Ministry of Education and Cultural Affairs and the Organisation for Economic Co-operation and Development at the Centre Universitaire, Antwerp, from 19th to 30th September, 1966.

Note : The French version of this report is available in published form at : Direction générale de l'Enseignement supérieur et de la Recherche scientifique, Cité Administrative de l'Etat, Quartier Arcades, Bruxelles 1, Belgique.

70300

FOREWORD

This publication is an account of a Seminar on the "Development of Higher Education" which was organised and financed conjointly by the Belgian Ministry of Education and Cultural Affairs (Department of Higher Education and Scientific Research) and the Directorate for Scientific Affairs of the Organisation for Economic Co-operation and Development.

The "Centre-pilote belge pour l'étude des investissements dans l'enseignement" which is directed by Mr. Geens, Director-General of Technical Education, was responsible for preparing this meeting. Mr. Geens was assisted by Mr. Hermans de Heel and Mr. Capon, in charge of research at the "Centre-pilote". The Seminar was held at the Centre Universitaire, Antwerp, and received every assistance from the Rector of the University, Mr. Massart.

Mr. Debeauvais was responsible for the O.E.C.D. Secretariat and was assisted by Mr. Laderriere in organising the meeting and by Mr. Hecquet in drafting the report.

The French version of this report has been published by the Belgian Ministry of Education and Cultural Affairs.

TABLE OF CONTENTS

Page

Address by the Minister of Education 7

Problems of long-term Development of Higher Education.. by Dr. A. King 11

Preface 23

First Topic

The Structural Reforms in Higher Education

Record of the discussion 27

The Reform of Higher Education in France and the Creation of University Technical Institutes 41

Introduction to the Discussion on Structural Reform: the French "Instituts Universitaires de Technologie" considered as an example, by Mr. Weil 47

Higher Education's New Task : Continuous Education, Retraining, up-grading schemes, by Mr. Arnaud 55

Second Topic

Methods of Forecasting the Number of Students

Record of the discussion 79

Forecasting and Planning the Number of Students in Higher Education by Mr. Redfern 91

Methods of Forecasting Enrolment in Higher Education in France by Miss Dutilh 107

Critical Survey of the Forecasting Methods in Belgian University Population Forecasts by Mr. Meulepas 131

New Aspects of the Problem of the Geographical Expansion of Higher Educational Establishments by Messrs. Coetsier and Bonte 167

The Creation of New Universities of Technology in the Netherlands by Mr. Ruiter 175

Study of the Pass Rate, Drop out and Cost of University Education: Example of a Method of Analysis by Mr. Coetsier 193

Third Topic

Forecasts of Manpower Requirements

Page

Record of the discussion 215

Assessment of Demand and Supply of Highly skilled personnel by Mr. Ruiter 227

Note on Forecasts of Requirements for Engineers, Management and Professional Staff by Mr. Corpet 259

A Method of Forecasting as applied to "Training Requirements" by Mr. Vermot-Gauchy 269

The Demand for University trained Engineers in the Netherlands by Mr. Ruiter 303

Fourth Topic

Cost and Financing of Higher Education

Record of the Discussion 335

Reflections on Belgian Experience in Cost Analysis and Financial Forecasting by Dr. Spaey 341

Cost and Financing of Higher Education by Mr. Debeauvais 351

Policy Problems Arising from Aid to Students by Mr. Laderriere 377

x

x x

List of Participants 415

ADDRESS BY THE MINISTER OF EDUCATION AT THE OPENING OF THE SEMINAR ON THE DEVELOPMENT OF HIGHER EDUCATION

The Rector,

Ladies and Gentlemen,

As Minister of Education it is a special honour for me to greet you on behalf of the Belgian Government and bid you welcome to Antwerp on the opening of this Seminar on the Development of Higher Education organised by O.E.C.D. in conjunction with the Ministry of Education.

The large number of participants in this Seminar bears witness to the importance of its subject and to the interest taken in the many aspects of this extremely topical problem.

I think that the choice of Antwerp for holding this Seminar is a particularly happy one, as it is only recently - in fact since 1965 - that higher education has entered fully into its own here; Antwerp became a university city with the creation of the State University Centre and the recognition of the Saint-Ignace University faculties under the Act of 9th April 1965.

I am accordingly convinced that the rectors and heads of the university institutions, whom I see here in force, will form a particularly interested audience and will take an active part in the discussions.

At this opening meeting of your Seminar, devoted to problems of the development of higher education, I wish to express my keen interest in the many activities of the Organisation for Economic Co-operation and Development, notably in the field with which we are more particularly concerned - education.

Similarly I wish to pay tribute to the energy of its Directors and senior officials, and to congratulate them on the positive results they have managed to achieve to date.

I shall ask Dr. King, Director of Scientific Affairs, whom I have great pleasure in welcoming among us to-day, to be my interpreter in conveying to the Organisation our sincere gratitude for the valuable assistance it gives us in seeking the most appropriate solutions to the educational problems with which our country - like so many others - is faced.

I know that Dr. King, as Director of Scientific Affairs, gives special attention to the work we are undertaking.

I thank him most sincerely for having acceded to the organiser's request to come here to-day to talk to us of his experience of higher educational problems in the O.E.C.D. countries. I also thank Mr. Debeauvais of O.E.C.D. for giving us the fruit of his experience as director of studies at the Ecole Pratique des Hautes Etudes at the Sorbonne.

The organisation of higher education, the theme chosen for this Seminar, is certainly one of our main preoccupations at the present time, both in Belgium and in other Member countries.

The growth of the student population since the end of the Second World War has been such that higher education and the financial resources allotted to it have developed at a rate never previously attained and are assuming dimensions which would formerly have been considered unthinkable.

France, the Netherlands,the United Kingdom and Germany - to name only the countries nearest Belgium - have tried to find the best solutions to cope with this revolution in student numbers; they have been led to create new universities, to decentralise existing universities and faculties, to envisage new methods of education.

It is therefore apparent that the confrontation of the ideas and concepts held in the various countries of the Organisation and the discussion of the results obtained are bound to be most useful and instructive in determining the choice of measures to be taken in the future.

I am therefore very happy, ladies and gentlemen, that this Seminar is attended by many of the most highly qualified experts in the organisation of higher education.

The papers to be given in the course of this week and the discussions to follow them will, I am convinced, be extremely valuable to us in the decisions which the legistature and the executive must consider in order to adapt the organisation of higher education to the radical changes characteristic of our modern age.

The main subjects of your discussions:

- Forecasts of enrolments and student statistics for higher education planning
- Forecasts of needs for highly qualified manpower
- Structural reforms in higher education
- Costs and financing of higher education

clearly show the extent and complexity - both in breadth and in depth - of the theme of this Seminar.

The rate of increase in and the growing volume of the financial resources allotted to higher education in recent years certainly justify the need for rational planning.

May I insist on the magnitude of the organisation of problems concerning higher education, as a result of the steadily accelerating evolution of the student population.

I wish to say, in addition, that it is not enough to solve these problems in the light of to-day's society.

On the contrary, it is indispensable to work out valid forecasts as to the probable further evolution of the student population and also to elaborate not only medium-term but also long-term estimates of the demand for intellectual staff in the different branches and specialities.

At present we must already think of elaborating a University system that will fit to-morrow's needs, which means the requirements even of the year 2000.

We are indeed responsible for the future of our country and of the coming generations; we must now lay the foundations on which to-morrow's society will be built.

At the same time I feel I must emphasise the part to be played by our higher educational institutions, the contributions they ought to make to the cultural and intellectual, social and economic expansion of the developing countries.

Your contribution in that domain as experts in the field of higher education planning is indeed most important for promoting harmonious co-existence between the different continents.

I wish specially to stress this fact because the State University Centre in Antwerp, where this Seminar is going to take place, includes an Institute for Development Co-operation at which numerous African students have already been trained in preparation for the functions of leadership in their own country.

It remains for me to offer you my best wishes for the progress of your work and the full success of your discussions.

May this Seminar be as successful as the international conferences previously organised under the auspices of the Organisation for Economic Co-operation and Development, viz.

- the Conference held in Washington in October 1961 on the importance of educational investment for economic development;
- the Conference held at Kungälv, Sweden, in June 1961 to examine the problem of intellectual reserves.

In this connection I should also mention the O.E.C.D. programmes on educational investment and planning, which set an example in this field.

In recalling the previous work of the Organisation I wish to pay tribute to the memory of the late Mr. Darimont, Director-General of Higher Education and Scientific Research and Chairman of the O.E.C.D. Committee for Scientific and Technical Personnel. Despite his heavy responsibilities in the Ministry of Education Mr. Darimont always took part with his customary enthusiasm and keenness of mind in the bold projects of the Organisation to which he insisted on making a personal contribution.

I now declare open this Seminar on the Development of Higher Education and look forward with great interest to the results of your discussions.

PROBLEMS OF LONG-TERM DEVELOPMENT OF HIGHER EDUCATION

by
Alexander King
(Director for Scientific Affairs, OECD, Paris)

I. INTRODUCTION

Recent years have seen a rapid extension of university development including the creation of many new institutions and much further growth is to be expected in the next few decades. Most of this expansion has been made in terms of replication of what exists, although a number of new universities have been conceived and launched on somewhat untraditional lines. Nevertheless many questions have been raised as to the adequacy of the universities in providing for the higher education needs of contemporary society and the economy.

These problems are likely to become still more acute. The very rapid expansion of secondary education in most countries and the gradual acceptance of the right to equal opportunities for advanced education will make even greater demands on the universities in the next twenty years, raising the question of how to maintain quality at the highest level and at the same time provide an adequate and relevant education, especially for the 19-22 age group. The basic question now beginning to emerge is whether the existing concept and performance of the university, essentially medieval in its origins, organisation and its orientation is uniquely appropriate to the coming situation, where a high proportion of the population will seek entry, many of whom will lack any strong vocation for learning. There is an a priori case for at least considering diversification of the system and institutions of higher learning to provide more closely for diverse needs. There is also a need for international discussion at a level of frank assessment of experience between the different countries now facing this problem.

The problem goes well beyond the modification of structures and administrative procedures and necessitates a redefinition of the relation of the university to society, the economy and the individual, resulting not only from explosive expansion but from rapid social and technological change. Unless this is done - and it is required if the highest quality of research and learning are to be retained - the very large financial burden on governments will lead insiduously to a whittling away of academic freedom and independence.

Many facets of this complex of problems are being studied both at national and international levels, but in only a few instances is the attempt being made to delineate its totality. The work of O.E.C.D. in educational planning, and particularly its attempts to relate forward investment in education to the manpower structures required for economic development plans, has thrown attention on the educational system as a whole, the articulation of its various levels, the need for an understanding of its dynamics and development. As part of this the needs of higher education seem to deserve particular attention and this has led, amongst other things to the convening of this meeting, for which we are deeply grateful to the Belgian government.

The present paper, as a general introduction to the theme, attempts to provide a background of perspective against which the various trends and suggestions for study and action may be seen. It attempts to review the present functions of higher education and to suggest how expansion may modify them. It notes some of the deficiencies of the existing structures in fulfilling these functions and in furthering innovation.

II. FUNCTIONS OF THE UNIVERSITIES

In a short introduction such as this, the term university is used for the sake of brevity to cover institutions of higher education in general. It is realised that these vary considerably from country to country in Europe and that special types of institutions such as the Grandes Ecoles of France and the German Technische Hochschule differ in many essential details from the European mean.

i) The main function of the university remains, at least in theory, the instructional and cultural communication of the accumulated traditional knowledge of mankind and its interpretation in terms of contemporary understanding. In medieval times this was essentially theological, but as a cosequence of the Renaissance, it underwent a difficult and slow transformation to assimilate also Hellenic and Roman ideas and the elements of natural philosophy. Only much later were the sciences taught as experimental subjects. The university was conceived in terms of the education of a small elite, initially of scholarship, but also gradually as a consequence of the Industrial Revolution, in terms of social status. Changes began to be felt at the close of the last century with the onset of university expansion both in numbers and in range of subjects taught. Literary and linguistic subjects were introduced gradually in the face of traditionalist opposition. The real crisis of university development began about 1880 when it became no longer possible for a single scholar, no matter how erudite, to encompass the whole of knowledge and to be in a position to contribute to learning within any discipline which interested him. This led to specialisation, to the erection of barriers between the disciplines and to the decline in universality.

ii) The second function is the extension of knowledge, at first through interpretation and speculation, but later through research and the acceptance of the experimental method. By the beginning of the present century, especially in Germany, research in the natural sciences, with its spectacular uncovering of the laws of nature, began to dominate over the instructional function. Professors began to be immersed in investigations of all kinds and to resent time spent on teaching. Academic appointments were made more and more on a basis of reputation for research with little weight given to competence and devotion in the imparting of knowledge. This led to acute academic snobbery, to an excessive importance being given to the extension of knowledge for its own sake with little interest in its application or consequences, an intellectual gratification, at times exceedingly selfish when untouched by a sense of responsibility, yet as we are all aware, revolutionary in its consequences. In this way the universities became centres of intellectual innovation which has had an incalculable influence in shaping the world we live in to-day, while their discoveries will lead to a still stranger to-morrow. It is somewhat ironical to note that while this innovative function in society has been so marked, universities have shown practically no innovation within themselves, or for the educational system as a whole.

iii) The third function of the university is the provision of higher skills, directly or indirectly a vocational activity, which has become increasingly important as student numbers increase as well as the proportion of entrants without specific scholarly dedication. Since the beginning of the century at least, an ever larger number of university students have regarded higher education as an entry to the professions, in addition to its social advantages. To-day in the medical schools, engineering departments, faculties of law, business schools - to mention only a few - the vocational function dominates. At its best, this is pursued in terms of real education while in some it is crudely technical. The existence of vocational education as a true element of the university is closely related to its proximity to research. Where the latter is strong, the medical or engineering school is the main point for the reconciliation of theory and practice, of injection of new knowledge to the professions - a very important matter for progressive societies.

iv) Fourthly, the universities have become centres of criticism through evolution of a questioning function, made possible through their tradition of independence from the establishment. They have a strong tendency, derived from the need of scientists to look without prejudice at the basic facts, to question traditional beliefs and political dogma, to follow new, and at times unpopular lines of thought and thus provide a basis for social and economic development. This is a force resistant to that complacency to which affluent societies of the past have always been prone, a mechanism of biological survival, exceedingly precious to society, but as yet seldom consciously deployed. It can probably only be maintained through the continued existence of universities of highest quality and with real independence from the central bureaucracy.

v) With the vast increase of knowledge of the present decades, there is a particular need to establish a comprehension of the unity of knowledge and of the interaction of its parts, which only the university with its juxtaposition of disciplines is in a position to provide. This integrating function, as a result of academic isolation and faculty rigidities, is all too easily abdicated.

vi) The responsibility of universities to ensure that the new knowledge which they generate or interpret is quickly disseminated throughout society, i.e. the extension function, is not always fully accepted. The education of generations of men and women who enter society and the economy and do not devote their lives to scholarship is, of course, its most direct and most important manifestation. In times of rapid change, however, when technology is developing quickly from the results of fundamental research, with immediate influence on economic life and social structures, there is a particular responsibility for the universities to communicate and to discuss the significance of changes of which new knowledge gives rise. On a national level, the universities are potentially a major reservoir of high quality and independent advice which governments can draw on for important tasks. In some countries this resource is regularly made use of, in others hardly at all.

With massive university expansion, universities have to depend essentially on governments to provide their finance, while without the practical patronage of governments, advanced research and scholarship would hardly exist at all. In the United States, this has led to an unwritten understanding that support and money will be provided and university independence maintained, if the academics take responsibility not only for the education of future generations, but also comprehensive and sustained involvement with the problems of the community. In some other countries such a sense of social responsibility does nos always accompany university privilege; academics often tend to remain aloof from the changing societies which their knowledge shapes and have little interest in the practical consequences of their work.

vii) The universities provide an important vehicle of social stratification. They have by tradition preserved an elite and helped to maintain an inherited class line. They can, as is at present the case in some of the developing countries, lead to the creation of new class differentiation with its attendant conflicts or may be used to open up traditional class strata. In the O.E.C.D. countries,with their acceptance of equality of opportunity for education as the right of the citizen, the last of these is operative and is an important social mechanism.

The various functions of the university, enumerated above, are of course all of great value to society and are, to a greater or lesser extent, combined within the university systems of most of our countries. The main problem for the future relates to the balance between the instructional or cultural, the vocational and the research functions with the need to ensure that each is effectively provided for either combined or in different departments or institutions. Undue emphasis to any one of these could, in conditions of greatly increased inflow of students with widely different requirements, lead to a tragic loss of quality with respect to the others.

III. STUDENT MOTIVATION

Discussion of the functions of the university cannot be isolated from consideration of problems of undergraduate motivation and the changing influence of these on university instruction, orientation and optimum structure, as student populations increase.

Theoretically the university community consists of scholars, not only dedicated academicians but also individuals interested in ideas, eager in the pursuit of knowledge and loyal to the traditional purposes of the university. For the last century at least, the true scholar has usually been in the minority as compared with those who came to the university for purely vocational reasons or primarily to take part in its social activities with but marginal interest in intellectual life. Of course there are many in the directly vocational streams, such as medicine or engineering, with the intellectual curiosity to probe far beyond the mere techniques of the higher trades which they have come to learn, but many also who regard the years spent at university as providing an entry ticket to a world of good jobs, whether they learn special skills in the process or not.

The numbers of those with dominantly social interests have decreased rapidly as higher education ceased to be a finishing school of the social elite, but they have been replaced, and in much larger numbers, by the apathetic undergraduate drawn from all strata of society. As economic and social barriers melt away and the universities grow and multiply, the dilution of the population of scholars by those without clear objectives becomes an ever greater problem. For the United Kingdom, the situation has been aptly summed up by Sir Eric Ashby: "Thousands of students in Britain today are exposing themselves to higher education because to accept a university place was a line of least resistance. They are not at universities because they are interested in learning, nor even because their parents were ambitious on their behalf. They were good examinees who have been drafted by the offer of local authority awards. Their purpose is to get a degree and get out". From the American scene, Martin Trow describes the situation thus :

14

"The central problems of mass higher education are not the problems of identifying talent, financial expansion or raising faculty salaries, rather the central problems are student boredom, their indifference and hostility to learning. Hundreds of thousands of students from culturally impoverished back grounds and with narrowly vocational interests enter college for the many jobs and occupations which now call for college diplomas, but without marked enthusiasm, curiosity, originality or involvement with ideas and learning".

This situation, if at all general, is perhaps less a criticism of the individual student than of the irrelevance of much of what the contemporary university has to offer to meet the needs of its population. This irrelevance is to a large extent caused by an inability or unwillingness to distinguish between the vocational and cultural functions. Student indifference may be a by-product of affluence, the lack of need to struggle as is suggested by the fact that under privileged and special problem groups, such as emigrants, seldom manifest such indifference. If this trend is real, it is likely to increase in importance with rising proportions of the population at the university and could prove a real menace to the maintenance of scholarship and the advancement of learning.

IV. SOME OF THE PROBLEMS OF EXPANSION

In planning the extension of higher education then, or even in assessing the significance of various present criticisms of lack of efficiency of the university system or of its will to meet the needs of society or individuals more relevantly, it is important to bear in mind the quite different and at times even conflicting nature of its functions as described above. Too often these matters are discussed in terms of the existing university as the unique institution of higher education which can be modified but slowly and marginally and on the assumption that it has the single objective of encouraging scholarship. The provision of occupational skills, however respectable, is regarded at the best as a usefull by-product. The increasing numbers of entrants and the decreasing numbers genuinely devoted to learning will inevitably tend to dissipate this mystique of the university; to maintain it could in fact seriously weaken the strength and quality of the true university which will be greatly needed in the future.

In view of the difficulties which arise for the universities from this confusion of objectives, likely to be further aggravated by expansion, it may be useful to sketch a number of the specific trends, as problems, so as to serve as a guide to enquiries aimed at securing a better delineation of the issues and leading to innovation and possibly diversification within the system. This is briefly attempted below:

i) Dimensions of the problem

The underlying uncertainty here is whether, with very greatly increased university populations resulting from consumer pressure, and probably consisting to a large extent of individuals without a conscious sense of vocation and perhaps largely indifferent to learning, the traditional university with its stress on scholarship and research can provide the appropriate education. Furthermore, if this is attempted can university quality be maintained and increased? The following issues require investigation in this context:

a) Probable total demand for higher education in each O.E.C.D. country in 1980 and in 1990.

b) The proportion in each case of this total likely to require occupational directed education, as for example for medicine, engineering and the law.

c) The proportion likely to aspire to a career in research, university teaching or other positions of higher learning.

d) The expected level of fundamental and of applied research appropriate to be undertaken in institutes of higher education.

e) The relation between the figure (per country) under item (c) to the probable demand for higher level teaching and research of various types.

Relative to these quantitative issues, the following (mainly unanswerable) qualitative questions should be asked :

f) Is the university (or equivalent) likely to be the normal type of institution for the provision of high professional skills?

g) Is a university degree likely to be an important status symbol for a large proportion of the population and if so will an attempt be made to provide this, irrespective of institutional quality?

h) Is it probable that the financing of higher education will be dominantly from government funds ? If so are governments likely to accept the necessity of maintaining independence of universities devoted to the advancement of learning as well as for the whole passive system of higher education, probably by then, mainly vocational?

ii) Structural questions

The need for structural diversification of higher education arises from the increased number of entrants to be expected as a result of demographic, social and economic pressures. It is doubtful if the academic approach of the traditional university is suitable to the needs of mass higher education, and this poses the following problems for investigation:

a) On the assumption that the university, combining the different functions enumerated above, cannot remain the unique or even the most common type of institution for higher education, it has to be considered to what extent there should be a clear distinction, generally or, in certain cases, between institutions, for the advancement of learning and those for providing higher professional skills.

b) The advantages, or otherwise, of separating technological institutions (German technical high schools, MIT) from general universities.

c) The value of the experimental creation of high level monotechniks (as in USSR) which, while oriented to occupations (medicine, agriculture, mining, etc.) provide a strong basis of education and allow for advanced research.

d) The interest which attaches to the universities in their pursuit of learning by the recognition and protection of a number of "elite universities" such as, in fact, exist in U.S.A.

e) With the extension of specialisation, the universality of the university may not in any case be possible in future, and it may have to be cultivated through inter-university co-operation and the creation of networks of centres of excellence.

f) The diversification of higher educational structures will inevitably have consequences for the concept of the "degree" both as an academic and a status symbol.

V. ADJUSTMENT TO FUTURE CAREER NEEDS

Following the general argument, it is to be expected that the increasing numbers of aspirants to higher education will be of two general categories; (i) those who have already chosen a career direction, e.g. in the natural sciences, medicine or economics, irrespective of whether or not they have a genuine attraction towards learning, or intend to practice a profession and (ii) those with no special sense of vocation, but who look forward nevertheless to useful, if unformulated careers in industry, commerce or elsewhere.

For the former, development of existing institutions, curricula and methods of instruction should not be too difficult to accomplish. For the latter, the problem is more difficult, namely how to educate and train very large numbers of students whose predecessors went into the economy at a much earlier age. It is to be expected also that the non-committed will not want to submit themselves to long periods of university study or concentration on subjects which may seem remote from their probable future needs; nor will they wish to remain outside the labour market and its financial rewards longer than may be respectable and necessary. If these suppositions are true, one of the greatest needs will be to devise, as is being begun in France and elsewhere, a variety of short courses and possibly of institutions for individuals in the 19-22 age-group to provide a wide knowledge of the contemporary world and to give them a basis of discipline and technique which will enable them to develop later in terms of their then recognised career needs. It is necessary to consider whether such courses should take place in the general university side by side with honours and post-graduate work or whether special colleges to cater for this need can remain intellectually stimulating if separated from higher studies and the vitalising influence of the research environment. A further problem will be to ensure that the graduation symbol from such courses, degree, diploma or otherwise, can carry sufficient social status to encourage entrants, rather than merely accentuating intellectual stratification.

A second and related problem for the universities, arises from the growingly accepted concept of continuous education. Rapid change of techniques, especially in applied subjects such as engineering and management, may make it necessary for people to be given periods of re-training at various stages in their career. This requires the universities to co-operate with industry to devise various types of refresher courses and for industry to accept as a measure of enlightened self-interest, that such re-equipment of its managers, professional staff and technicians will be a normal process for which absences on pay, sometimes prolonged, must be made possible. Equally, industrialists will themselves have to help the universities in the provision of specialist retraining courses.

Gradual adoption of such continuous education will have profound effects on the initial, formal stage of education before entering a career. University level instruction will in many cases have to be readjusted to provide the essential mental discipline, method of attack on problems and basic intellectual skills to enable new knowledge to be assimilated throughout the career. Packets of information and techniques, suitable for the first job, will quickly become obsolete.

This great complex of problems gives rise to the following issues for consideration:

a) The introduction of comprehensive short (2-2 1/2 year) degree courses for the 19-22 age group, on the assumption that the greater proportion will not be anxious to submit to lengthier sojourns at college.

b) The relative merits of conducting such courses in separate institutions or as first cycle courses in the more general organisation of higher education.

c) Special arrangements to be made for students, vocationally uncommited, but who expect to find careers in industry or commerce, e.g. undergraduate business schools or general courses as mentioned in (a) above.

d) There may be a real need, as a result of rapid technological change, to establish short (3-6 month) courses for people of 30 - 40 - 50. If this is so, the proper institutional basis has to be devised as well as methods whereby the co-operation of industry, substantially and financially, could be effectively ensured.

e) If, in certain subjects, the concept of continuous education be accepted, modification will have to be introduced to the initial formal stage of higher education to provide the necessary background of discipline and technique for later development. Consequently, the majority of short, formal courses, under (a) above, might have to be devised in conformity with this requirement.

VI. POSTGRADUATE STUDY AND RESEARCH

Increasing sizes of student populations and the shortage of university teachers to instruct them, especially at the initial period of the expansion when the output from higher learning will be insufficient to fill all the new posts, could throw a heavy burden on existing university staffs and diminish efforts in graduate teaching and research. This must not be allowed to happen for many reasons including that of maintaining university quality and vitality. The very process of university expansion necessitates extension of the higher activities including the unfolding of new knowledge demanded by an ever more sophisticated science and economy. If Europe is to retain a strong and vital research effort comparable with the world's best and not suffer a selective drain of its best needs, facilities for research must be on such a scale as to provide opportunities for original work unsurpassed elsewhere. This is not merely a matter of collecting sufficient and costly equipment but of securing a critical mass of scientists at particular centres to provide the necessary variety of attack on difficult problems and the criticism of peers, without which scientific advance is slow.

In Europe, and especially in its smaller, advanced countries, these problems may have strong influence on university development, demanding specialisation and concentration of effort on certain subjects in certain universities and the relinquishing of teaching and research on the same subjects in others. Full effect can hardly be given to this need without a degree of international co-operation, perhaps through the construction of European "centres of excellence".

There are many other problems at the highest level requiring urgent attention; these include the provision of many post-graduate specialist courses (in contrast to research) and the breaking down in some places of barriers between subjects, within the university to permit research and teaching in interdisciplinary and borderline subjects on which the most rapid advances in knowledge are to be expected.

VII. SOME OTHER PROBLEMS

While the above are probably the most important problems facing higher education, many others exist both within the system and in its relations with society. For example, there are many possibilities opened up by new teaching methods, which will become increasingly worth experiment as the student population increases, and straight individual tuition becomes more difficult and formal lectures less attractive. The present attempts at programmed learning are just the beginning of a serious growth of educational technology, in which computer development will play an important part, laying stress on the managerial and inspirational qualities of the university teacher - as indeed of teachers at all levels - qualities not always combined with high research ability.

University administration will also have to be developed and made thoroughly professional. After all, universities are large scale enterprises with highly diversified management which calls for an unusual degree of administrative competence. Acceptance of substantial government contracts for research and development and the need for inter-university co-operation to ensure effective resources in some fields is one example of a situation requiring institutional ingenuity and administrative skill.

Finally, a further word must be said about the relations of the university with the community. With the very large funds provided to higher education by the tax payer, many university teachers are already fearing encroachments on their independence. This independence is, as we have seen, extremely important for society, but in the future it is likely to be preserved only if it is accompanied by a real sense of responsibility to the community, with its ever more complex problems. In some countries, industry-university relationships hardly exist and there is a real need to build up a mutual confidence between the two sides which can contribute greatly to both, but which will never succeed if the university remains an ivory tower. Projection of new ideas and approaches throughout the community is a difficult task for the universities, who must at the same time retain full intellectural integrity, but it has to be cultivated. In the less developed countries this is especially important. The purely scholastic university, imitated from western models, can seem even more remote from community needs than in the developed countries where the product of university education is easily assimilated by society. On the other hand, universities evolved in terms of local needs and future growth could become real spearheads of national development.

PREFACE

This volume is the result of the work of a seminar on the development of higher education held at the University Centre of Antwerp, in September 1966. It contains a summary of the discussions, and also the main working papers, some of which were subsequently revised. A total of 55 participants from 11 countries attended the meeting, which was organised by the Belgian Ministry of Education in co-operation with the O.E.C.D. Directorate for Scientific Affairs.

The O.E.C.D. Committee for Scientific and Technical Personnel, whose Chairman was at that time the late Frederic Darimont, who died tragically a short while after, had recommended that the regional courses organised between 1963 and 1965 to train specialists in human resource planning be replaced by more specialised seminars organised at the instigation of Member countries. Mr. Darimont had suggested that the first seminar be held in Belgium. It was subsequently decided that the topic for discussion would be the problems raised by the development of higher education in both Belgium and the neighbouring countries.

Four aspects were selected among those of more direct interest to the higher educational authorities:

1. Enrolment forecasts

There has been an unprecedented rise in the number of students in most O.E.C.D. countries, largely in excess of the forecasts, and it is now necessary to improve the methods used so far, especially by undertaking a detailed analysis of the various factors responsible for this increase.

2. The forecast of manpower requirements has mainly been covered by partial studies confined to certain categories of senior staff such as engineers, technicians and doctors; it is generally agreed nowadays that more all-embracing forecasts should be made in order not only to estimate the risks of shortage in certain categories but also the employment prospects of the graduates of higher education and their distribution among the various sectors.

3. Several O.E.C.D. countries have undertaken the structural reform of higher education, especially as regards the training of higher technicians. Others are still only at the preparatory study stage, but this current of reform makes it particularly useful to compare every country's problems and experience.

4. The financing of higher education raises problems which are all the more difficult to solve, as the faster rise in enrolments is accompanied by a considerable increase in unit costs. The rise in public expenditure seems to have been more rapid in higher education than in the other branches of the educational system. Detailed cost analyses and international comparisons should be made in order to decide whether this is an exceptional circumstance or a lasting trend.

The work on these four topics was divided between plenary sessions - in which the discussions were preceded by introductory statements - and working parties, which went into the various country experiences in greater detail. The rest of the book and the work as a whole show that the problems of developing higher education are fairly similar from one country to another, which adds further point to the pooling of experience. It also seemed necessary to consider all forms of post secondary education together, as the present tendency is to contest the separation which was formerly so marked between the universities and the other higher educational establishments. Furthermore, the forecasting methods used in the various countries are regarded as so unsatisfactory by the very people who practise them that their improvement is everywhere under study. The suggestions in the O.E.C.D. Manual of Statistics, and in particular the proposed individual data system, were carefully considered in this context. Emphasis was also laid on the importance of improving international comparative data in order to fix educational enrolment and manpower targets, and especially in order to verify the probability of national projections.

Forecasts become fully significant only when they are used as a means of elucidating decisions. The technical aspects were constantly associated with the problems of educational policy during the seminar. This was facilitated by the composition of the group, since there were experts as well as administrators and educators, in addition to young research workers. The confrontation of national experience was therefore accompanied by a presentation of all the different aspects of the educational system.

This seminar, which has been followed by several others, gave positive results in the opinion of those who took part. Side by side with scientific meetings between teachers and research workers and international commissions at government or administrative authority level, there is also room for seminars where theories, policy problems, plans and common experience can be compared and freely discussed. These could no doubt be used as a means of propagating innovations in the field of educational policy.

FIRST TOPIC

THE STRUCTURAL REFORMS IN HIGHER EDUCATION

RECORD OF THE DISCUSSION

Dr. A. King's paper dealt with the long-term problems arising from the development of higher education. This is also the context of the reform of higher education in Sweden, the recent creation of the Colleges of Advanced Technology (C.A.T.) in the United Kingdom, and the establishment of new types of universities in Britain (Sussex, Lancaster, Essex, York) and Germany (Constance, Bochum).

For practical reasons most of the papers dealing with reforms in higher education refer to the French reform which is to come into effect between now and 1969.

Although this example is significant, it is not the only one which merits consideration and the discussions which followed papers broadened the debate and raised a number of points regarding both the anticipated and desirable development of higher education in Member countries.

The discussions on structural reforms may be reduced to three main themes :

1. The analysis of the context in which structural reforms are taking place.
2. The institutional aspect of reforms.
3. The consideration of procedures for implementing reforms.

1. THE CONTEXT OF THE REFORMS IN HIGHER EDUCATION.

The first point brought home to the participants was that in most Member countries the realisation of the need to adapt the structures of higher education is not generally the result of any re-thinking by the Universities themselves. It clearly comes from outside, under the pressure of the spontaneous demand for places by students and the need for qualified personnel to meet the requirements of economic expansion. The compelling necessity for re-adjustment obviously makes it more difficult and more urgent to seek solutions and put them into effect.

Although the problem is not equally acute in all countries the rapid increase in the number of candidates for higher education has become a widespread factor in the last few years, and everything suggests that the number of students will continue to grow over the next ten years. Several factors have been cited as the cause of this expansion, but it is primarily due to the steady growth in the number of secondary schooling enrolments during the previous period.

At the same time, the number of students wishing to continue their studies at university level has also increased as a result of the policy of postponing the final decision of the pupils as to their future course of study, allocating the pupils to either short or long secondary courses and giving equivalent status to an increasing number of secondary school diplomas leading to higher education.

In certain countries this trend has been re-inforced because the bigger age-groups of the children born after the end of the second world war have now arrived at the threshold of higher education.

No less decisive is the fact that a growing proportion of the population now considers a university course as the key to a successful social and professional career. As Prof. Weil pointed out, access to higher education is increasingly regarded by public opinion as a right which it seems difficult to restrict without repudiating democratic ideals in education.

Even countries like the United Kingdom which have always applied a strict selection procedure to prospective university candidates have realised this change of attitude.

It is therefore difficult to control the increase in the number of students applying for higher education and several participants see in this a particularly negative aspect of the problem of reform.

The growing economic need for qualified personnel is the second external constraint which is compelling the university to re-adapt itself. The analysis of methods of forecasting labour requirements is dealt with later, but three aspects of this problem may be mentioned here:

1. The economic development of the past few years has revealed permanent shortages in a number of occupations which normally call for an advanced type of training.

2. Technological advances are leading to a growing diversification of functions and call for new types of training which are not always available at traditional institutions of university standing.

3. The increase in the number of scientific discoveries demands a much greater measure of professional and intellectual adaptability on the part of the trained personnel concerned than was previously the case. But such adaptability is possible only in the case of personnel with a more intensive scientific training and a wider general education.

The changeover from a higher educational system reserved for an elite to a system open to the masses is therefore not the only problem: higher education must also be more effectively adapted to a constantly changing economy and be able to satisfy its qualitative and quantitative demand for qualified personnel. The attempt to find a simultaneous reply to these two types of constraint is rendered more difficult in as much as there is no guarantee that the increasing number of students can be oriented to suit the needs of the economy. The possibility of conflict between the attempt to achieve a "democratic" and a "functional" ideal at one and the same time was one of the points most frequently raised in the course of the discussions.

There is also a growing awareness that in order to satisfy these two exigencies it will not be sufficient to increase the number and capacity of institutions of higher education. Real structural changes will be required going far beyond a mere administrative re-organisation.

In this respect the initial forecasts of the development of higher education are now obviously incomplete and inadequate to the extent that the expansion was forecast within the limits of the existing structures.

The fact is that the student body is growing and likely to grow on such a scale that it challenges the very nature of present institutions of higher education. The latter were able to operate normally so long as their intake did not exceed 3 to 5 per cent of any age group, but not when the proportion suddenly rose to 10 or 20 per cent. As certain participants pointed out it is not only the unprecedented increase in the number of students which calls for a change in existing structures but also the fact that students are increasingly heterogeneous as regards their social origins, previous schooling, level of ability and motives (or absence of motives) in embarking on a course of higher education. In some countries these changes have led to an increase in drop-outs and examination failures. Furthermore, the vocational training function is tending to gain more and more ground in institutes of higher education in order to meet the direct demand for highly skilled personnel for economic and social development. This raises the problem of maintaining the balance with the other traditional functions performed by higher education i.e. its contribution to the progress of knowledge through the development of research, the maintenance of a high standard of teaching and the training of teaching staff. This situation is therefore compelling the universities to reconsider the whole question of the coexistence or hierarchy of these functions.

But this latter aspect clearly makes the problem of the reform of higher education more complex: not only must a satisfactory compromise be found between a democratic and a functional ideal but also a balance must be struck between several functions which recent developments have affected.

It was therefore important to consider the type of institutional setting likely to achieve this twofold balance.

This was the spirit in which the participants discussed structural reforms in institutes of higher education.

2. THE INSTITUTIONAL BACKGROUND OF STRUCTURAL REFORMS

The need to consider the problem in its relation to higher education as a whole is certainly a point on which participants were unanimous. It is no longer possible to dissociate the universities from the other institutes of higher education and the reforms must be planned against the background of post-secondary education as a whole.

Certain participants pointed out that the distinctive features of both types of institution have become progressively blurred in all Member countries in the past few years.

1. Students are increasingly recruited by the universities and the other institutions of higher education on a common basis i.e. the range of diplomas awarded at the end of the long secondary course. This is the result of the tendency to give equal status to all types of secondary diploma as far as access to universities and non-university institutions is concerned. Previously, the road that led to one or other of these institutions tended to depend on the secondary school course which the student had taken.

2. The differences in length of course which used to be one of the features distinguishing universities from other institutions of higher education are less pronounced than before. The duration of studies at non-university institutions is tending to lengthen while certain universities have established short training cycles for their students. The French reform which plans to divide the syllabuses in the re-organised science and arts faculties into two distinct cycles each leading up to a diploma is a good example of this tendency. The increasing number of junior colleges in the United States is a further example.

Nor are the entrance requirements for universities stricter than those for other kinds of higher education as many non-university establishments have a much stricter selection system than certain university faculties.

3. In some countries several non-university establishments of higher education have been granted university status. The example of the colleges of advanced technology (C.A.T.s) in the United Kingdom, several advanced schools of commerce in Belgium and several Technische Hochschulen in Germany were cited. The French reform now provides for the organisation of higher technical education in the context of the universities whereas senior technicians used in most cases to be trained in secondary technical schools.

Moreover, as Prof. Weil pointed out, this trend towards what he called a "unified system" as opposed to the previous "segregationist system" is dictated by the pressure of public opinion. Not only do the students and their parents demand the right to continue their studies at a higher level once they are in possession of their secondary diploma but, rightly or wrongly, they increasingly consider that only the university can guarantee them the high standard of training and, particularly, give their diploma the social status they seek. This was why we felt that differences of status and prestige as between the two types of institution should be reduced to the minimum.

Mr. Geens took a rather more qualified view. In Belgium, for example, non-university higher education attracted a number of students who otherwise would undoubtedly not embark on a course of higher education. They often felt that this type of training was likely to offer them better opportunities for a successful career than a university course.

What are the relations between the university and the other institutions of higher education to be in the future? Should all forms of higher education be encouraged to combine in a single institution, i.e. the university, or should there be a new distribution of functions among the various types of institution on the basis of certain criteria? And in this case what should these criteria be? The choice between a practical or a theoretical training, as envisaged by the French reform? Or division of labour, the university reserving research for itself, or perhaps the length of the course ?

Most of the participants considered diversified or evolutive solutions. The fact is that the problem of the relations between the universities and the other establishments of higher education differ from one country to another. In countries where advanced technical education has developed independently for many years (Belgium, Switzerland and Germany for example) the tendency is to coordinate relations between higher education and the universities in order to encourage the mobility of students and teaching staff and the gradual evolution of syllabuses rather than work towards integration with the university. On the other hand, in France, where higher technical education has not developed on comparable lines, it is preferred to establish it within the university framework owing to the prejudice felt by students against non-university technical training. But the problem of reforming the "Grandes Ecoles" or the problem of their relations with the universities which was evoked by the Boulloche Commission has not been tackled in the French reform.

However, in all cases it is essential that the development of the various types of institutions should be planned as a whole both as regards the recruiting of students and the need for trained personnel.

The preference shown by the great majority of students for a university training could hardly be countered without setting up a system of compulsory orientation. The universities cannot therefore confine themselves to training research personnel or teachers for higher and secondary education but must also meet the "social demand" of those who seek a specialised vocational training or even a broadening of their general culture.

For this reason many participants considered that what is needed is a reform of university institutions themselves and not merely an adjustment of their relations with other institutions of higher education.

Present experience shows that it is becoming more and more difficult for any one establishment and any one body of teachers to discharge the multiple functions assigned to university institutions to-day. The flow of students into these establishments has not only led to a decline in the quality of the teaching but has also restricted the possibility of developing research and training future teachers for higher education, which also needs to be expanded. Similarly, the growing specialisation of studies which is bound up with the function of vocational training is endangering the role of the universities as centres of humanistic culture and disinterested research.

The point was discussed whether it was sufficient merely to revise the hierarchy of university functions. This solution seems inadequate for it is difficult to subordinate certain functions to others. It would be more appropriate to seek an institutional setting in which each of the university's functions could be developed without sacrificing or even subordinating the other functions.

In one of the working groups Mr. Debelle submitted the conclusions of a study on "Conceptions of the University" which he had conducted with Mr. Drèze at the requets of the Fondation Industrie-Université and the Institut Administration-Université de Belgique. According to this study, published in Brussels in 1966, the functions of a university can henceforth be fulfilled only through a complex of university institutions i.e. through a differentiated network of establishments, each having its specific assignments. This could be achieved by specialising certain establishments in one or more functions or in certain disciplines or else on the basis of identical functions discharged by establishments of different levels. This conception clearly implies a comprehensive development policy for these institutions and would mean, in particular that a network of connections would have to be devised between the various establishments without which the whole system would be no more than so many juxtaposed units and the various functions of the university would not be any more harmoniously integrated than they are at present.

This conception may be compared with the example set by several of the new universities which have chosen to specialise in a few disciplines or concentrate their efforts on certain functions.

Under the Vth Plan in France each university may concentrate on specific types of research and a substantial proportion of the Vth Plan's equipment appropriations have been allocated on the basis of this specialisation.

This differentiation between one establishment and another goes perhaps further in the United States than anywhere else. As Professor Weil recalled, the United States has found a satisfactory and very flexible solution to the problem of making higher education democratic. Any holder of a secondary school diploma is entitled to study at the university but each establishment makes its own selection in the light of the candidate's abilities. The result is a pyramid of university establishments which are very different in quality and very diversified in the training they offer. However, there is considerable mobility between one institution and the other and this makes it easier for the system to readapt itself perpetually (1).

+

+ +

---

(1) See Martin Trow: "The democratization of Higher Education in the United States"; Archives Européennes de Sociologie, Volume III, 1962, No.2.

We shall now deal with certain points raised in the course of the discussions i.e. orientation and length of courses, selection of students, recruiting of academic staff, organisation of faculties and adult education.

3. SPECIFIC ASPECTS OF STRUCTURAL REFORM IN HIGHER EDUCATION

1. Orientation and length courses

There are two reasons why the length of courses must be reconsidered.

a) If all (or most) holders of secondary school diplomas are to have access to higher education they should also be able to derive benefit from their studies irrespective of when they conclude them. One way of meeting this desideratum is to divide university courses into several cycles each leading to a diploma which can be of immediate use in economic life. To mention only one example, the French reform divides arts and science courses into several cycles:

- a two-year basic cycle ;
- a second cycle of one or two years at two distinct levels i.e. the "licence" and the "maîtrise";
- a third cycle mainly designed to train future research workers.

These levels of study may be available within one and the same establishment (in France), or, in separate establishments as is frequently found (in the United States).

b) Economic developments have led to a growing demand for executives with an intermediate training between the long university course and the secondary school diploma course. New short cycles of higher education will therefore have to be created to meet this demand. The Instituts Universitaires de Technologie in France and the new technological university of Enschede in the Netherlands, are the results of this need.

In certain countries it is also planned to reduce the length of the traditional university courses. It is now no longer possible for anyone to be content all his life with what he learned at the university and it is therefore unnecessary to attempt to get students to imbibe all the knowledge they need. Emphasis will no doubt have to be laid on a more thorough acquisition of the basic groundwork than is at present the case, and on a better grasp of method. It is calculated that certain faculties might even cut the present length of their courses by one or even two years. However, the desire to cut syllabuses and reduce the length of courses will have to be reconciled with the need to give each student a specialised knowledge which he can use directly in his professional life. The reform of higher education in Sweden is very significant from this point of view. In the faculties (arts, human sciences and natural science) where the aim was largely to give students a general training, syllabuses will be given a more distinctly vocational bias. But in faculties where this was already the case (medicine, odontology, technology), the syllabuses will concentrate more on general problems of method.

2. Selection and guidance of students

If higher education is to be opened up to a mass of students who vary widely in intellectual ability and educational background it will no doubt be more necessary than ever to adopt adequate systems of selection and guidance. As Professor Weil pointed out there must be a guarantee that the ablest students will go in for the most exacting disciplines and the longest cycles of training. Moreover, if the supply of graduates is to be more effectively adapted to the pattern of demand for qualified personnel in business and industry the distribution of students in the various branches of study and at the various levels of training will have to match the pattern of employment.

In certain countries the impossibility of providing enough teachers and equipment to meet the increase in the number of students has made it necessary to consider introducing measures of selection for entrance to certain faculties or advanced courses.

As regards guiding students in the choice of their studies it has been noticed that in the very countries where manpower demand is forecast by levels and types of training there is a certain reluctance to consider channelling students compulsorily in the directions indicated by the forecasts. Sweden for example continues to uphold the right of every student to embark upon whatever university career he chooses. In France the Vth Plan has endeavoured to quantify the optimum distribution of students among the various disciplines and types of institution, but except for the Grandes Ecoles where access is limited by the number of places and decided by competitive examination, students continue to be free to choose their field of study and there is consequently no guarantee that the actual distribution will tally with the desired pattern of distribution. The experience of previous plans shows that students' actual choices have not been in accordance with forecast needs.

Nevertheless, nobody believes that institutions of higher education can continue to disregard the question of their graduates' prospects. In future they will have to co-operate with the employment services in briefing students as to the careers open to them. A student's freedom of choice is indeed purely theoretical in the absence of any such briefing policy.

What can be done to detect abilities and to ensure that students taking up the hardest disciplines and embarking on the longest courses of training are indeed the ablest? The obvious answer is the adoption of an adequate system for selecting and guiding students in the light of their intellectual abilities not only at the start of the course but also while they are working through it.

The risk, however, is that this will arouse distrust among the public who are quick to see in any selective measure an obstacle to the democratisation of higher education. Admittedly, countries or institutions which have organised some degree of selection in the past have often done so on essentially negative grounds, seeking in most cases to restrict the number of candidates rather than to detect real ability. But as Professor Weil pointed out the result is identical if there is no machinery of selection, in the sense that selection then takes place through other and less valid criteria such as social status, personal ambition or family income.

A practical procedure for organising selection and guidance is difficult to specify in detail but the following three ideas emerge from the discussion on this point:

a) In countries whose institutions maintain the principle of total freedom of access to holders of secondary school diplomas, students unlikely to stay the long course will have to be detected as rapidly as possible and care will have to be taken to redirect them into other forms of education or find a place for them in the working world. If this is not done it will be tantamount to postponing the day of failure for these students. They will have wasted precious time and occupied, to no purpose, a place in a university which is already overcrowded.

b) The selection and guidance policy must be coherent and co-ordinated throughout all types of higher education or at least all courses at the same level. In Sweden for example the application of a "numerous clausus" to students entering the faculties of applied science and medicine has worked to the detriment of faculties to which access was still unrestricted. Many students enroled in those faculties because they cannot gain access to the others. Some even do so provisionally in the hope that they may be eventually selected by the faculties with a limited enrolment. French higher education is in a similar situation owing to the prestige of the Grandes Ecoles where the number of places is limited, whereas access to the faculties is open to all holders of the baccalauréat.

c) As mistakes are always possible care will have to be taken not to make orientation and selection decisions irrevocable. There must be more opportunity of switching from one type and level of training to another, particularly in the first year of study, from university to non-university institutions and also from establishments of higher education to a job in industry.

To what extent should all students who wish to do so be allowed to complete all the stages of a university career? If courses of study are divided into several cycles, it is doubtful whether most students will be satisfied with the short cycles designed to prepare them directly for an occupation. Mr.van Norden quoted an example from the Netherlands: at the University of Enschede most students working for the new technological degree which is a three-and-a-half-year course, wish to continue their studies up to the engineering degree as the latter is supposed to carry a higher social status.

The same problem will shortly arise in France at the end of the first cycle of the faculties of science and arts: are all students to be allowed a chance of embarking on the second cycle for the licence or the maîtrise or of choosing between these two degrees?

The reform expressly states that the examination board which is to issue the diplôme universitaire d'études scientifiques (D.U.E.S.) or littéraires (D.U.E.L.) at the end of the first cycle is required to indicate "the courses of study which appear to suit the student's abilities". But will this indication be given merely as advice or will it be binding on the student?

3. Teachers and scientific research workers

The speed-up in the growth of the student body has led to a rapid increase in the demand for teachers. In the short term it is proving difficult to meet this demand. The qualifications required of university teachers frequently had to be lowered and there has been a fall in teacher/student ratios particularly in the first year of study. It is this shortage of staff which is generally considered to be the reason for the increase in the number of drop-outs which is giving rise to more and more serious concern.

Academic staff are now obliged to devote more time than before to their actual teaching tasks which, if they are to be satisfactorily performed, require much more than the mere preparation of lectures and this can be done only at the expense of their research activities.

Furthermore, research workers are increasingly reluctant to take on teaching tasks for fear of being submerged in their turn by the large number of students.

The general opinion of the participants was that it would not be advisable to dissociate the two functions of teaching and research completely even in the interest of extending research activities.

Professor Weil emphasised that the only really effective way of detecting future research workers among the mass of students is to encourage permanent contacts between students and full-time research workers. The latter must be prepared to devote part of their time to practical or theoretical teaching. Economic development is likely to be increasingly dependent on the amount of research done by industry and it is therefore becoming essential that future industrial executives should be brought into contact with the world of research as soon as they begin their university courses.

An effort should also be made to widen the basis on which academic staff is recruited e.g. by co-opting advanced students who are working for their doctorate or their maîtrise. In the advanced technical colleges staff should be drawn to a greater extent from top-level people in industry. This would also tighten the links between the staff and the firms which are likely to use the graduates they train.

4. Faculties and departments

Several participants stressed the need to challenge the traditional division of universities into faculties, the latter no longer being functional units of teaching and research. Three reasons were put forward in favour of organisation by departments:

1. The new types of training which have emerged in the past few years have generally been created outside the faculties either because they lie on the borderland between several faculties or because the faculties were not prepared to cover these new disciplines. Departments would adapt themselves more flexibly to change.

2. The organisation of teaching in faculties often leads to much duplication of courses or laboratories which could no doubt be avoided by a re-distribution by discipline instead of professorial chairs.

3. If research activities are to function efficiently, funds, equipment and personnel would have to be regrouped in units larger than those which can develop in the framework of the faculties and particularly under the aegis of independent professors. The incumbent of a university chair who is generally appointed for life continues to be wholly responsible for

the use of the funds allocated to him. The advantage of departments, on the other hand, is to enable bigger research units to be built up where professors can pool their facilities and concentrate on a particular direction. From this point of view, departments provide a more effective and flexible framework than university chairs. However, other experts, such as Professor Weil, consider that the faculty may still continue to be an effective administrative unit provided it does not become a closed world. Several faculties could group together for example in order to form a "university institute" to co-ordinate joint activities. Neither is there any technical objection to two faculties deciding to merge their courses on identical subjects.

THE REFORM OF HIGHER EDUCATION IN FRANCE AND THE CREATION OF UNIVERSITY TECHNICAL INSTITUTES

This section summarises the main points in a paper published at the end of 1966 by the French Ministry of Education under the title "La Réforme de l'Enseignement en France: Août 1963 - Juin 1966".

1. THE REFORM OF SECONDARY EDUCATION

One of the main objectives of the reform is to give all children equal access to all levels of education and thus make the educational system truly democratic. The choice of a particular type of post-primary course, long or short, must not depend on a child's social background or the proximity of his home to a particular secondary school. The two-year observation cycle introduced in 1959 was increased to four years in 1963 in order to achieve this objective. Arrangements to house a number of lycée classes and a number of C.E.G. classes (Collèges d'Enseignement Général) in a single school, the Collège d'Enseignement Secondaire, under one head, will make the choice easier. Only on the completion of these four years of observation will pupils be allocated either to the second long cycle of secondary education which provides a general course or to a second short cycle preparing pupils directly for jobs in industry, commerce or the tertiary sector.

The second long cycle of secondary education consists of five sections corresponding to five main types of ability; each will lead up to a baccalauréat examination which will open the way to higher education.

- Baccalauréat A: literary and linguistic training;
- Baccalauréat B: preparation for the economic and social sciences;
- Baccalauréat C: providing a fuller training in mathematics and physics;
- Baccalauréat D: providing a training in natural science and applied mathematics;
- Baccalauréat T: providing a scientific and technological training.

A school-leaving certificate will be awarded to secondary school pupils who did not take the baccalauréat examination or who were unsuccessful but obtained a minimum mark of 8 out of 20.

To make this system as flexible as possible arrangements will be made to switch pupils from one section to another at the end of the first year of the second cycle (tenth year of schooling) and for this purpose the first year provides tuition in only three sections: literary, scientific and technical.

The second short cycle of specialisation is a two-year course (i.e. a total of eleven years' schooling) consisting of three sections: industrial, commercial and administrative, leading up to a "brevet d'études professionnelles". But apart from this two-year cycle a short vocational training course lasting one year (total of ten years' schooling) will prepare pupils for specific jobs in industry or commerce and lead up to a vocational training certificate.

2. REFORM OF HIGHER EDUCATION

A. OBJECTIVES AND SCOPE OF THE REFORM.

The reform of higher education has two main aims:

1. To change the curriculum structure of faculties of science and arts.

2. To create a new type of vocational training, parallel to the training in the faculties, to be provided by the Instituts Universitaires de Technologie.

This reform does not therefore cover the whole field of higher education and does not affect the faculties of law, pharmacy and medicine or the "Grandes Ecoles", or certain existing establishments of higher education (the advanced institutes of commerce, for example).

The changes in the structure of the scientific and literary training provided by the faculties are intended to strike a more effective balance between the three basic functions of these faculties and the university as a whole, the aim being to:

- provide an advanced scientific and literary training;
- contribute to the progress of knowledge and train research workers;
- ensure the training and preparation of teachers and top-level personnel.

To meet these requirements the course of study in these two faculties has been organised in three separate cycles corresponding to three levels of proficiency:

1. The first cycle lasting two years, gives students a grounding in their subject

2. The second cycle, leading up to the "licence" examination at the end of one year or the "maîtrise" examination at the end of two, will be specialised.

3. The third cycle open only to holders of the maîtrise, will train future research personnel.

The Instituts Universitaires de Technologie were created to meet the country's need for executives and senior technicians. The latter will receive a general education and an advanced specialised training. The senior technicians trained in the Instituts Universitaires de Technologie (I.U.T.) will have a more advanced practical training than engineers and a more extensive general education than simple technicians and will take over posts of technical responsibility in the manufacturing industries, research and the services. They will co-operate directly with engineers, research workers and administrative, financial and commercial executives, and will be filling a need which is likely to grow in importance with economic and social development, as a result of the acceleration and spread of technological progress.

B. MAIN FEATURES OF THE REFORM

1. Faculties of Science and Arts

a) Entrance requirements

As before, the baccalauréat awarded at the end of the secondary school period will remain the qualification for entrance to the faculties. However, as from the beginning of the university year 1968, entrance to the faculty of science will be restricted to holders of the baccalauréat in mathematics and physics (B), experimental science (C) and technical studies (T). Holders of other baccalauréats may, however, apply for admission to these faculties on the strength of other qualifications or, if refused on these grounds, after passing an entrance examination. Access to the faculties of arts remains open to holders of all types of baccalauréat.

b) Organisation of studies

The first cycle of two years will be divided into sections according to the fields of study selected, e.g. four science sections, six arts sections preparing students for the teaching profession and three human science sections, i.e. psychology, sociology, history of art and archaeology.

Transfer from the first to the second year depends on an examination.

The first cycle leads up to a diploma, i.e. the "diplôme universitaire d'études scientifiques" (D.U.E.S.) in the faculties of science and the "diplôme universitaire d'études littéraires" (D.U.E.L.) in the faculties of arts. These diplomas are awarded by an examination board and give access to the second cycle. In the faculties of science however, the examination board advises each student on the course of study which it feels is consistent with his abilities, i.e., study for the licence or maîtrise, specialisation in a particular subject or, if necessary, a switch to the Instituts Universitaires de Technologie.

The second cycle of specialisation leads up to the licence in one year or the maîtrise in two years.

In the science faculties, the licence can be obtained in three main branches (mathematics, physics and chemistry, natural science) while the maîtrise is divided into 12 special subjects, each requiring four certificates. In the art faculties, a distinction is made between the sections preparing students for the teaching profession and the human science sections. In the latter the licence year is identical with the first year of study for the maîtrise. In addition to the specialised licence and maîtrise there is a so called "free" licence where no subject is specified and students decide on the certificates they would like to take (except for certain combinations which are incompatible).

The third cycle, i.e. research, is open to holders of the maîtrise.

c) Training of secondary school teachers

1. Licence level

With effect from the summer of 1968, secondary school teachers will be trained and recruited at two levels: candidates will be selected according to their performance during the licence year and will receive a year's training at the Centres Pédagogiques Régionaux. At the end of the year, they will take a competitive examination open to the whole country (the CAPES) and the successful candidates will be qualified to teach all secondary school classes (long course).

2. Agregation level

After a year of preparation, students who hold the maîtrise may take a competitive examination open to the whole country for the award of the agregation. Successful candidates will be appointed to teaching posts in a secondary school or in some cases to the senior classes preparing pupils for the Grandes Ecoles. Those with the highest marks may be appointed to university faculties as assistants.

2. Instituts Universitaires de Technologie

The syllabuses, recruiting of students and composition of the teaching staff will be in keeping with the vocational character of the I.U.T.s. But the training given will be neither a simplified engineering course nor merely an extended technicians' course.

a) Entrance requirements

The I.U.T.s will normally be open to holders of a baccalauréat related to the specialised subject chosen. There will also be a special system of selection to enable candidates who are not holders of a baccalauréat to obtain access to the I.U.T.s provided they show evidence of their ability to profit from a course of instruction.

b) Special subjects taught

The training of senior technicians will not be limited to specialised industrial subjects but will include courses in administrative, financial and commercial subjects.

It will be quite a simple matter to introduce new special subjects to meet the foreseeable needs of the labour market.

In 1966-67, when the I.U.T.s were inaugurated, training was provided for seven special subjects in the industrial sector and three special subjects in the tertiary sector.

c) Organisation of teaching

The two-year full-time I.U.T. course will be both theoretical and practical, and will include a period in industry. The teaching staff are recruited on a special basis i.e. they are chosen not only from academics but also from persons with an industrial background.

The administration of the Instituts Universitaires de Technologie will call for constant co-operation between the universities and industry.

d) Forecast of the number of students

The forecast of the number of students at I.U.T.s will be based on the Vth Plan evaluation of the total number of students receiving higher education. The Plan anticipates that in 1972 there will be 750,000 French students taking post-baccalauréat courses of one kind or another. It is officially assumed that the universities and Grandes Ecoles will take 75 per cent of the total student body and the Instituts Universitaires de Technologie 25 per cent. Thirteen of these Instituts were due to open in 1966-67 but a number of pilot experiments had already been launched at the beginning of the academic year 1965. Six new Instituts will be opened at the beginning of the academic year 1967 and 57 I.U.T. departments will then be operating compared with 22 in 1966-67.

INTRODUCTION TO THE DISCUSSION ON STRUCTURAL REFORM: THE FRENCH "INSTITUTS UNIVERSITAIRES DE TECHNOLOGIE" CONSIDERED AS AN EXAMPLE

by

Mr. Weil

Before introducing the discussion on the objectives of the reform which has paved the way for the establishment of the "Instituts Universitaires de Technologie", I should like to make it clear that I am not really a specialist in educational planning. I am primarily a university professor whose views are his own and in no way commit the Directorate for Higher Education or his colleagues on the Reform Commission. On this understanding, I should like to tell you what the Reform Commission was aiming at and give you my opinion as to the pitfalls which must be avoided when the reforms are put into effect.

Needless to say we all feel that higher education should enhance the general cultural standards of all who receive it. This being granted, we must consider the scale higher education should assume, that is, number of students, number of teachers, premises, etc., with special reference to the problems of the government and the bodies financing this sort of education. Clearly, therefore, a purely intellectual criterion is not sufficient, and an answer must also be found to the question: what is the place of higher education in the national economy?

THE ROLE AND SCALE OF HIGHER EDUCATION IN THE NATIONAL ECONOMY

The role of higher education is to provide the economy not only with top level staff but also with those, at a slightly lower level.

The top is easy to define: it includes, for example, graduate engineers, certain academic staff and maganerial grades in industry with salaries comparable to those of graduate engineers. In a word it will cover all persons with managerial functions and salaries in the upper range.

Second-level personnel naturally include staff trained in the higher technical institutes of Germany, Switzerland and Belgium, generally known as "engineering technicians" ("ingénieurs techniciens"). But this category will not be regarded as solely consisting of such technical personnel; it will also include all people in the economy whose privileges, responsibilities and salary scale are similar to those of engineering technicians.

Once these two levels have been defined the problem is to determine the number of graduates in these categories a country requires for its economy.

For France, the elements of a reply may be gathered from the government bill on vocational training at present before the National Assembly (1). In the preamble to the bill the Minister of Education put the proportion of level I personnel needed by the economy (including research personnel) at 8 per cent, and of level II personnel at some 12 per cent of the active population. These proportions, however, reflect the present position and not necessarily that which may be desirable in the future. My opinion is that, although these figures may meet the present requirements, they still fall short of the standards for high level personnel that the French economy must achieve in 10 or 20 years' time. The trend in level I personnel during the past few years shows that its proportion is increasing by some 1 per cent per year. Furthermore the proportion of such personnel with an economic, legal or literary training is rising while the proportion with a specifically scientific or technical background in the conventional sense is falling. This is also true for level II personnel, in an economy where technological progress finds its expression in the constant evolution of the skills required.

We must therefore realise the need to change the present trends in France. In the United States this figure of 20 per cent has already been exceeded. If, for the time being, 20 per cent is accepted as the proportion of the age group starting at 17 or 18 years which will have to receive a training above secondary-school level, i.e. a university type of training, then the problem before the French Reform Commission was: how is this objective to be achieved and within what sort of institutional framework?

INTEGRATION AND SEGREGATION

A priori, the choice lies between several possible solutions which may be summed up in two main approaches: integration and segregation.

The American system is an example of integration; it is able to train level I and level II personnel under the same general label, i.e. as university students. For example, the man who graduates from Berkeley in level I or even above, and the girl who takes a domestic science course at Sacramento will both be graduates of the University of California : the difference in level of training will here be determined by differences in the length of the course or in the college (in the same university) they attended. In other cases different levels of training are provided in separate institutions. The ingenuity of the American system is that institutions whose levels of training, length of courses, and entrance requirements are very different all confer the hallmark of a university education.

---

(1) Enacted in December 1966 (editor's note).

The opposite system, which may be called segregation, is that one that has prevailed in France. We have had the universities and the "Grandes Ecoles" for level I, and the "lycées techniques", or more precisely their senior technician departments, for level II. The number of level II personnel was negligible compared with those of level I. This is the system also practised in Germany, which has the University and the "Technische Hochschule" for level I, and the "Ingenieurschule" for level II. A similar scheme operates in Belgium.

The system which the Reform Commission proposes to set up in France is as follows: the "Grandes Ecoles" and universities would normally be responsible for training level I personnel (although the Act also provides for level II training in universities) and the "Instituts Universitaires de Technologie" would train level II personnel.

The origin of the name "Institut Universitaire de Technologie" is significant. Two or three years ago, the Ministry of Education had considered establishing "Instituts de formation de techniciens supérieurs" (or "technique supérieure"). But these were planned as institutions which were to be completely separate from the university, governed by a different set of regulations, and operated by other staff. This would have been like the German system, in that a segregated approach would have been used. A number of my colleagues and myself opposed this idea, and we ended up with the compromise which is now familiar to you - the "Instituts Universitaires de Technologie". I personnally would have preferred to call them "Collèges Universitaires de Technologie", but several of my colleagues considered that this designation would not have set them sufficiently apart from the other complete courses of university training. But compared with the original "Institut de Formation de Techniciens Supérieurs" project the Institut Universitaire de Technologie marks a major step forward in the direction of integrated training. As the Instituts will be attached to each of the universities the system is therefore nearer to integration (and the American type of university) than to segregation.

But no law can be better than the people who apply it: the attitude adopted during the next ten years by administrators and teachers will determine whether the reform is applied in one direction rather than another, whether the trend will really be towards an integrated conception of higher education or whether things will slip back into the old system of segregation.

To my mind the Instituts Universitaires de Technologie will succeed only if certain pitfalls can be avoided.

PITFALLS TO BE AVOIDED IN APPLYING THE REFORM

The first is social segregation. Unless we are careful the danger is that institutions training level I personnel will automatically recruit their students from privileged groups in the community. It is not for any moral or sentimental reason that I should dislike to see this happen, but for economic reasons, since the economy requires that level I jobs be filled by the most capable people. We know that in all countries intelligence is evenly distributed throughout all the strata of society and any country with a selection system which does not enable the offspring of under-privileged groups to gain access to level I training is allowing most of its intelligence to go to waste. Instead of having 100,000 students with the highest intelligence quotient in level I, there will be no more than 20,000 or 30,000 with this quotient, while the remaining 70,000 or 80,000 will not be in quite the right place. If students are not allowed to be allocated to levels I or II on the basis of their social origin, those with the highest I.Q. would then normally be trained at level I, and those with a slightly lower I.Q. at level II.

Every effort must be made to avoid the system of segregation which is or was practised in the German Federal Republic where (I am quoting from a document published in that country) the "Ingenieurschule" is referred to as the school of social opportunity (der Schule der sozialen Aufstiege) which suggests that students entering level II institutions are those from the under-privileged classes.

This problem does not arise in France alone. Thus in the Soviet Union, there is apparently some concern to prevent the best places at the most important universities from being monopolised not by the children of the rich but by the children of the professors and of Party dignitaries.

But how can this social discrimination be prevented? What way is there of avoiding the situation that developed in France when technical education was established? What can be done to see that the children of less privileged, less wealthy or less ambitious parents are not pushed aside into level II, while those from the more affluent social classes succeed in taking over all the places available in category I institutions, by dint of repeating classes and examinations?

One way would be to reduce the outward differences between the two types of higher training institute to the very minimum. This can be done for example if their staff are pooled. For this reason the originators of the French bill propose to refer to teachers at the I.U.T.s, the universities and the grandes écoles as "university staff". It is also essential that the allocation of students to one or other type of institution should not be on the basis of separate examinations. I personally should be glad if they could be allocated on the strength of the marks they obtain at a joint examination: for example in the scientific branches those who are better at solving abstract problems should be directed to level I, whereas those who are more successful at practical work to level II, i.e., the I.U.T.s. Many more instances could be quoted: for example, in literature or languages, level I would be for students who had obtained the best marks in essay writing or the exposition of an idea, whereas students who were better at writing a report or a precis would go into level II. Two completely different types of mentality are involved, and they should be catered for by two distinct types of school, i.e. level I institutions for students who show particular brilliance and originality, and level II establishments for students with a more pragmatic turn of mind. This is what I should call recruiting university students on homogeneous lines, although a system of this kind would obviously call for much thought and caution, and I doubt whether it could be rapidly achieved.

A second way of avoiding social segregation would be to provide for two-way traffic between the two levels: primarily from the I.U.T.s to the universities by enabling the most brilliant I.U.T. students to switch to level I, although it should also be possible to reverse the process. This would mean organising examinations and collective coaching to give one set of students the theoretical training they missed in the I.U.T.s and the others the concrete and practical training they had not been able to receive at the university.

A third method is to offer graduates leaving the Instituts Universitaires de Technologie opportunities of improving their status. They should be able to attend university or other evening classes while pursuing their career. The United States and other countries have already acquired considerable experience in this field and M. Arnaud will give you fuller details of what we have achieved in France from this point of view.

A fourth way of avoiding social segregation is to provide level II training at the universities themselves. Our educational reform provides for two cycles at faculties of arts and science: the first is a two-year course followed by two parallel second-cycle courses - i.e. one for the master's degree ("maîtrise"), which is undoubtedly at level I, and one leading to a degree ("licence"), which trains future secondary teachers and prepare students for certain responsible jobs in industry and government.

The second danger facing the Instituts Universitaires de Technologie is that they may acquire second-class status. This pitfall can be avoided by keeping their syllabuses constantly up to date. Several German colleagues assured me some years ago (but perhaps the situation has changed since) that the syllabuses in their "Ingenieurschule" had become stereotyped. Personally I am always uneasy when people talk about the fundamental difference between science and technology. In my own special field (very-low-temperature physics) we have seen the switch from science to technology in the past ten or fifteen years. Liquid hydrogen, a substance formerly dealt with by very few research laboratories, is thus now used in very large quantities as a fuel for rocket propulsion and will be used in the near future even for aircraft. The result is that the qualifications required for handling liquid hydrogen are gradually changing from level I to level II. This was also true of electronics, which now falls within level II or even level III (technicians), whereas it undoubtedly used to rank in level I before the war. The same may be said of nuclear energy.

These examples clearly show the danger of drawing too marked a distinction between the I.U.T. syllabuses and those of the "grandes écoles" or universities. I.U.T. students cannot after all be taught the electronics of ten years ago on grounds of greater consistency with their educational level.

Areas of knowledge and the economic system are changing so rapidly that no one can hope to do the same job throughout his working life, least of all an engineering technician. But this obviously makes it more difficult to draw up syllabuses for the I.U.T.s. The fact is that I.U.T. syllabuses will differ from those of the universities and "grandes écoles" not so much in the level of knowledge required as in the greater emphasis they lay on the practical side of the subjects taught.

Industrialists, who are the users of this knowledge, are increasingly aware of this trend. The attitude of the representatives of industry on the commission which drafted the I.U.T. electrical engineering syllabuses may thus be mentioned - it was they (rather than the university representatives) who requested that the intellectual level of these syllabuses be raised, by providing more mathematics and physics.

The third pitfall is in connection with the placing of these students at the end of the course. As placing depends on supply and demand, their salary scale must neither be too high nor too low as compared with the remuneration of graduate engineers. If it is too high industry will give preference to the graduate engineers, if it is too low no student will want to enter the I.U.T.s. A proper balance must therefore be struck, but at a point definitely higher than a monthly starting salary of 800 or 900 francs which a senior technician now draws as against the 1,600 francs or so for a graduate engineer. The experience we gained in Grenoble in this connection seems fairly conclusive - in 1957 we set up a department to train students for the diploma in advanced technology (the D.E.S.T.), and this level II training was provided by the Faculty of Science from the outset; we now have about 200 students working for this diploma. But the diploma was awarded only after a practical probationary period of 9 consecutive months in a firm. Manufacturers naturally made their trainees no promises, but had time to find out what they were worth and after the probationary period generally kept them on, often at quite an attractive starting salary in the neighbourhood of 1,200 francs a month. On our side, we could award our diploma without any qualms as the student was certain to be given employment. This idea of a probationary period has unfortunately not been adopted in the reform now proposed.

In conclusion, I should like to refer to a final problem which is peculiar to the French higher educational system.

So far I have invariably distinguished between two categories of institution of higher education representing two levels of training.

In actual fact the French system is more complex, since level I training is provided in two distinct institutions, i.e., the universities and the "grandes écoles". Admittedly the universities subsequently retrieve a number of students who graduate from the "grandes écoles", since only universities are empowered to award doctorate degrees.

But recruiting for these two types of institutions is very different. The socially privileged systematically send to the "grandes écoles", where admission is very restricted, their most gifted children, and even those who are not quite so gifted, as I mentioned. Conversely, the universities recruit the not-so-talented students of the privileged classes and some who are talented from the less privileged classes. The social segregation which thus takes root in level I immediately after the secondary school stage might be eliminated by making the first cycle at the universities similar to the classes which prepare students for the "grandes écoles". This system would then make it possible to delay the final choice between the "grandes écoles" and the university. This again is a long-term task, one which might take perhaps ten years.

What is to be the place of the I.U.T.s. in the present hierarchy? Actually some of us wonder whether the I.U.T.s. will ever achieve the degree of growth planned by the reform, and feel we may revert to the sort of malthusianism which has always been a feature of technological training in France. True enough, at the beginning of the reform the I.U.T.s will be few in number, since the system is entirely new. They will therefore offer some sort of guarantee as regards future employment and quality of training. The danger is that matters may stop right there, one reason being, that teachers will not want the I.U.T.s to become the dumping ground of higher education. And parents might be faced with the following choice: first, the engineering schools, strictly limited to 6,000 candidates per year; secondly, the universities which so far have taken almost unlimited numbers of students; and, third, the small number of Instituts Universitaires de Technologie.

Most students would therefore be bound to crowd into the universities, which would be a very serious matter since these are level I institutions, unless heads of departments, anxious to prevent the universities from becoming the sumps of higher education were in turn to introduce a strict screening system. The system would then work as follows: there would still be 6,000 engineering candidates for the "grandes écoles", but there would be a fixed number of students at the universities and a limited number of students in the I.U.T.s. The talented students would then again flow into the universities and the quality of teaching would therefore improve. But in this as in the previous case, the country would be deprived of the highly qualified personnel needed in 1985, 1990 or 2000. In my opinion this is the kind of situation we must here and now make every effort to prevent.

HIGHER EDUCATION'S NEW TASK:
CONTINUOUS EDUCATION, RE-TRAINING,
UPGRADING SCHEMES

by

Paul ARNAUD

Professor at the Faculty of Science, Grenoble
Director of the Institute of Higher Vocational Training

> "To offer all human beings the means of providing for their own needs, of ensuring their own well-being, of knowing and exercising their rights, of understanding and performing their duties; to secure for each the opportunity of perfecting his skills and of preparing himself for the social functions he has a right to perform, of developing the talents bestowed on him by nature, and so establish a real equality among citizens and make factual the political equality recognised by law: this should be the primary aim of national education and, from this point of view education is a duty for the authorities concerned to see that justice is done." (1)

These views were expressed by Condorcet in 1792 and they define very well what we understand to-day by the expressions "upgrading schemes", "occupational advancement", "continuous education". Although the terms are new, the idea is not, and its apparent rediscovery to-day is merely because problems of this type have become far more widespread and acute in our civilisation than they were 174 years ago. If there is a good deal of talk about upgrading schemes (perhaps there is more talk than action), this is not just because it is the fashion, but because we are becoming aware of this exigency of the times and which must be integrated into a context of social development and economic expansion for any modern, or would-be modern nation.

We propose here to determine the various concepts covered by these terms - often vague though familiar - to study their various aspects and to define their meaning (though we realise that this dissection is to some extent artificial and that in real life the various types of training we shall describe are interdependent and often overlap).

---

(1) Quoted in reference (I) at the end of this article.

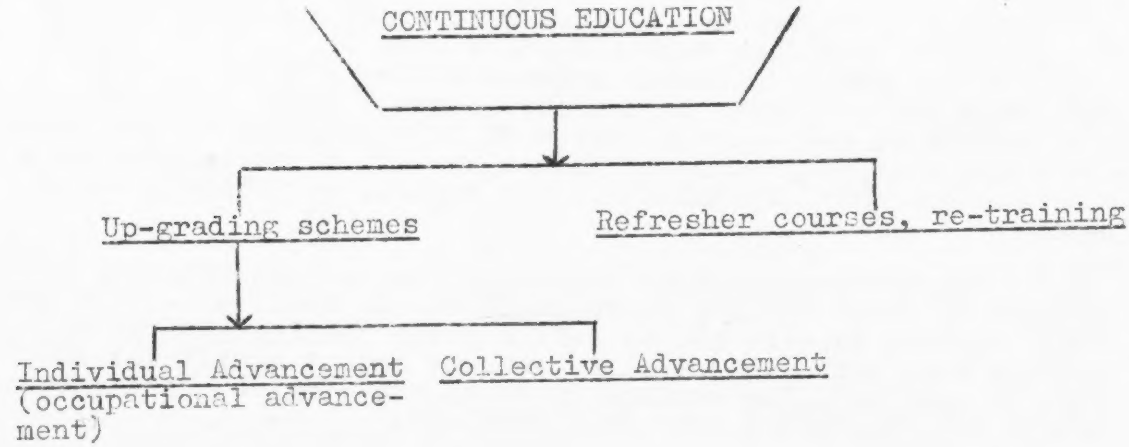
After defining various forms of continuous education, indicating their specific objectives and indicating the requirements that make such activities necessary, we shall survey the problems and difficulties of all kinds which hamper their implementation, and shall consider the solutions that have been, or might be, adopted.

It would be presumptuous to pretend to exhaust the subject and find all the solutions in so short a time, but if we define the problems clearly and look at them objectively, have we not already begun to solve them?

I. DEFINITIONS AND OBJECTIVES

Of the many terms currently used, continuous education seems to us to be the most comprehensive and we shall adopt it here to designate all training and refresher courses for persons already in employment, whatever the level of such training.

This term covers a wide range of activities which may be distinguished according to their objectives as follows: on the one hand, "up-grading schemes" - which may include activities leading to individual advancement (occupational up-grading training), or to group advancement - and, on the other, refresher courses or re-training.


CONTINUOUS EDUCATION
Up-grading schemes
Refresher courses, re-training
Individual Advancement
(occupational advancement)
Collective Advancement

a) OCCUPATIONAL ADVANCEMENT

This concept is no doubt the clearest in the mind of the public. It represents the opportunity given to workers to make a personal effort to train while in employment, and thus improve their position on the occupational ladder, and thereby, on a broader field, on the social ladder.

The need to make such advancement possible and to encourage it to the utmost is justified from the point of view of:

- the individual
- society
- the economy

At the level of the individual, this is obviously no more than an elementary matter of social justice, each individual being entitled to aspire to a "social success" which is the measure of his virtues and talents and not the result of various determinants. A survey was carried out in 1961 in France by the National Institute of Demographic Studies to find out what, in our society, constitutes social success. The survey covered 2500 persons listed in the "Dictionnaire biographique français contemporain" (French Contemporary Biographical Dictionary) and included the best known people in politics, arts, government, sport, the armed forces, science, literature and religion. Among the fathers of those personalities we find:

2.8 % manual workers
5.7 % farmers
17.2 % heads of firms
45.1 % members of the professions or higher civil servants.

Towards 1900 the French active population included 30 % manual workers, 46 % farmers, and 5 % heads of firms, higher civil servants or members of the professions. We therefore observe a distortion factor of 10 for sons of manual workers and of 13 (in the opposite direction) for children from the most advanced environments.

Similar observations may be made concerning the intake of the "grandes écoles", 66 % of their students being drawn from 5 % of the population, as shown in another INED survey.

It is therefore apparent - and these figures were not really needed to prove it - that everyone does not begin with the same opportunities and that success comes more easily and more frequently to those who have a good start.

An individual is largely conditioned for life by his family environment, his geographical origin (town or country), and according to whether the population distribution between the various social strata is fixed and immobile. There is no "vertical mobility" in our society and one might sometimes be tempted to call to mind the privileges of the Ancien Régime.

We might also mention the determinant of education (closely connected with that of family, since the fate of an individual depends in practice on the manner in which he has employed (or "has had to" employ) the first fifteen years of his life.

What can be done to remedy this situation?

In the first place, of course, a real democratisation of education at all levels, since the first fifteen or twenty years of one's life are the best for "learning" - not for acquiring once and for all training to last a lifetime (we shall revert to this point later) but for building a cultural base, aquiring modes of reasoning and methods of thought that will enable man throughout his life to face up to the tasks in front of him.

To a large extent, only those who have had the benefit of a sound education have any chance of success through "normal" channels, and the value of this education factor is, so to speak, squared in the formula for success, since a broad education, apart from its immediate profitability, develops social ambition and the desire for emancipation.

But even if education were more democratic, the problem would still exist. There will always be individuals who, for various reasons - illness, family circumstances, hazards of existence, or simply disinclination for study at a particular age (1) - were not able to acquire, when young, all the training and culture their minds were capable of absorbing; once they have been integrated into the active population, formal education can do nothing more for them. Moreover, the criteria of success at school (memory, assiduity, etc.) are not necessarily those of success in later life (judgment, courage, social sense, etc.), just as failure at school does not necessarily mean failure in life.

---

(1) " Hé Dieu si j'eusse étudié
au temps de ma jeunesse folle
j'eusse maison et couche molle
mais quoy ? je fuyais l'escolle..."
(F. Villon)

It is therefore important that any man, at any age, should be able to advance independently of the instruction he may or may not have received, and to develop to the full his intellectual capacity and his personality. Matters must be so arranged that the individual is conditioned only by his personal gifts and his own wishes. This is the essential unchanging objective of occupational advancement.

At the economic level occupational advancement appears just as necessary. It is not possible to go on recruiting top-level staff from only a small fraction of the population, defined, moreover, by quite arbitrary criteria, as we have seen. In the present state of affairs, we are depriving ourselves of the benefit of the untapped reserves of intelligence, and it is essential to explore and develop this human capital.

The figures are there: employment forecasts for the next ten years for France, and certainly for many other countries too, show that requirements for technical managers and engineers are large, and especially for technicians and foremen, requirements which will not be covered by traditional training facilities (which at present in France, for example, produce half a higher technician per engineer, whereas they ought to produce three). The lower levels must therefore be tapped in order to supply the higher levels, and this at a time when one-third of the adolescents leaving school between 14 and 17 to take up employment have not the necessary qualifications to reach the first steps of the occupational ladder. It is estimated that in the next years in France nearly two million persons should be drawn into a general shift of the active population towards the higher levels of the occupational classification.

(We should make it clear that these are promotions in the strict sense, i.e. vertical shifts. If we include refresher courses and retraining activities, which are no less necessary, and which we shall discuss later, it is estimated that 500,000 persons should return to classes each year - or even 750,000, having regard to the productivity of existing facilities. (1)

Occupational advancement's economic role will therefore be irreplaceable and indispensable in the coming years. Even if traditional training facilities were reformed, broadened, and adapted, they are too slow to meet requirements in the time required. Such an educational policy as is beginning to take shape in France with the creation of University Technological Institutes is bound to take a relatively long time to bear fruit, and only by promoting men at present in lower-grade jobs to those higher ones they are able to do can the economy obtain the specialised skilled staff it requires within the necessary time limits.

---

(1) Figures quoted in reference (I); see also the paper by Mr. Pierre Laurent "Bill on vocational training" of 6th September, 1966.

Another reason - qualitative, not quantitative - makes the training of persons already in employment as higher technicians particularly valuable. Up to now, too many technical students have been drawn from among the young people who failed to achieve a "nobler" career or one which was considered to be so, i.e. on the more theoretical side, so that the Higher Technician's Diploma which to the man in the trade represents a climax and a consecration, becomes a second-best for the students who has failed in his ambition to travel the "royal road" of abstract scientific studies. Yet we are more likely to produce a good technician by giving an operative the basic scientific knowledge and the general education he lacks, than by placing in front of a machine a "failed" student who considers himself degraded by "going over to the technical side".

Training to allow a worker to carry out a better job is clearly an essential factor in the development of his personality, as well as in social evolution and economic progress. It is a profitable investment, at both firm and national levels.

b) REFRESHER COURSES

We have become used to hearing of the extraordinary speeding-up of technical progress. Every day the press, radio and television inform us of further technical prowess, and the interval between basic research and application is becoming shorter and shorter. There is an actual race to achieve the most remarkable application, a race from which the (somewhat unscientific) idea of competition is not always absent.

Veritable technical revolutions have taken place in the space of a few years such as the widespread replacement of electronic tubes by semi-conductors, or the invasion of our everyday life by synthetics.

The amount of knowledge required to carry out the various jobs is forever increasing. Man is replaced by machines, but the machines need operators, of whom different skills are required: the pedestrian becomes a car driver, the navvy the driver of a bulldozer, the accountant a computer programmer, the farmer must have sound notions of engineering, chemistry and biology, etc.. (1).

In the face of this development the man on the job living under the perpetual threat of being overtaken by technical change, of finding his knowledge surpassed and his skill insufficient, must make a constant effort to keep up-to-date, not only in his own field but also in related techniques.

---

(1) Even the arts are not excluded from this development and music will soon be comprehensible only through mathematics.

All of us are in the same boat, and the need for this continuous adjustment to present circumstances, or even for complete retraining, does not apply solely to the "technician" in the strict sense of the term, but also to the doctor, the teacher, the administrator ... Ideas, theories and techniques now become obsolete so quickly that the conception of learning a trade - and especially of acquiring competence in it - once and for all, is out of date.

(If apparently the number of failures in individual careers, have not become more numerous, this is because remuneration based on seniority rather than efficiency is still almost the general rule).

Everything therefore goes to show that effective training cannot be given once and for all at the beginning of one's lifetime. As Louis Armand wrote, "only a system of continuous education could enable each person to keep his knowledge up to date with developments whereas in the present state of affairs, most men end by losing ground. Any training system which concentrates on the period of youth is out of date ... There is no longer any question of considering that the citizens and the working population of to-morrow will be trained mainly at school, and will be definitely classified for life... A man should be able to see his situation evolve not only on the basis of what he has learned in the past, but also on that of what he accomplishes in the course of his lifetime .... The period when instruction was concentrated on youth will be regarded as a paleo-cultural one." (1)

Modern man must therefore get used to the idea that he must continue to learn and to improve himself throughout his life. If he wishes to keep "in the running", he must be capable of going back to school at any time.

Moreover, apart from the reasons given above, to postpone the acquiring of some types of advanced knowledge to an age when the mind is more mature and can make better use of it, is pedagogically defensible. This would make it unnecessary to relearn certain things that have been forgotten because they were learned at an age when their value was not appreciated.

A coherent system of continuous education permitting man to keep adapting himself to his job and helping him to achieve the necessary retraining, is just as necessary as the purely vocational institutions; if activities for advancement can be associated with a certain degree of vertical social mobility, continuous education would correspond to the quest for horizontal mobility in employment levels.

---

(1) L. Armand. "Plaidoyer pour l'avenir", publ. Calmann-Lévy Paris.

c) COLLECTIVE ADVANCEMENT

The third section of continuous education is collective advancement. We shall not deal with it at any length and have mentioned it just for the form, not because it is of secondary importance, but because this seminar is not really concerned with problems of this type. According to the terms of the Act which gave it official status in France, it concerns "the training of paid workers called to exercise trade union responsibilities, particularly in economic or social bodies", but in fact it goes farther than this and covers training in law, economics, human relations, etc. for all persons exercising responsibilities in these fields, particularly group responsibilities.

This is of great importance in our civilisation, which is becoming increasingly one of negotiation: international organisations, various national commissions, works committees, etc., and it is regrettable that individual and collective advancement should sometimes be opposed, the first being considered prejudicial to the second, whereas they should be regarded as complementary.

II. PROCEDURES - TEACHING METHODS - ORGANISATION

The foregoing does, we feel, show adequately "why" a complete, concerted policy of upgrading schemes is essential in a country's development programme. We must now consider "how" these objectives can be achieved, analyse the problem arising and find possible solutions. We find these problems at two different levels, namely that

- of the individual
- of teaching methods and institutions,

and we shall now consider them.

a) HUMAN PROBLEMS

With the individual, that is, the "subject" faced with the possibility of improving his situation by making personal effort at training, the difficulties start even before he begins. The worker must first become aware of his potential capacities, must want to develop them, and then must make up his mind to undertake the effort. But apparently "over-one-third" of the adult wage-earners under twenty-five have definitely accepted their condition and are not considering any action that would help them get promotion. (1)

---

(1) See reference (I) at the end of this article.

They must therefore be informed: public opinion must be made receptive to the idea of upgrading schemes, and the belief - imbued since childhood - that to be an adult is to stop learning, must be eradicated. Information must be given, of course, concerning the means of promotion offered, their particular features, and their outlet possibilities; but this information should be objective and frank, the firm's difficulties should not be underestimated, if serious errors of orientation are to be avoided; anyone taking courses which are too difficult for him to follow will be disappointed and bitter if he doesn't succeed, and his failure would discourage his colleagues in advance from making a similar effort. In this connection it would be highly desirable to give potential trainees an opportunity to assess their own capacities, for instance by tests. The results of the tests should be used very cautiously and in all cases the final decision must rest with the individual concerned.

This preliminary information should therefore create a desire for promotion - often contradicted by a kind of resignation to living conditions - and at the same time permit proper orientation concerning the level aimed at and the specialisation chosen, in view of the outlets possible.

These are the conditions under which occupational advancement may be said to be "really open to all" and will not be a trick or something exceptional reserved for the top few.

The difficulties arising during a worker's retraining are fairly obvious.

The effort required of an adult to complete his occupational advancement is usually a long one, since, by definition, he can devote only a fraction of his time to it; the effort is also arduous, because, apart from being made in addition to what are often long working hours(and perhaps with incidental strain such as crossing the town in the rush hour), it has to be made by someone who may have lost the habit of intellectual work. Lastly, compared wihh that of an ordinary student, the effort has to be made alone and tends socially to isolate the person making it. Occupied by his work, he is constrained to sever his relations with his colleagues, to give up any social or cultural activities, or sports he may have had, and to isolate himself completely in his studies. He may feel lonely even when with his family, because he is more or less misunderstood by those around him, on whom he necessarily imposes some degree of discipline. The individual is therefore alone with his vocational, educational and family problems, and must be helped if success is not to be confined to exceptional persons or to those in particularly favourable conditions.

The most critical problem is certainly that of during whose time the training should be done (and the attitude of heads of firms on this matter).

- First possibility: training should be done outside working hours, i.e. entirely during leisure. This applies to evening classes - at present the most widespread methods. Although undoubtedly the most difficult solution for the trainee - its disadvantages are obvious - it should not be rejected out of hand, for under this system the worker has the advantage of being completely independent of his employer, of whom he need ask no special favour (e.g. adjustment of hours) and may even leave in ignorance of his future intentions.

As this method does not require any participation on the part of the firm (at least so it seems, but we shall revert to this point later), it is frequently the only one applicable at present. Its disadvantages may be reduced by more widespread use of indirect media (radio, TV, correspondence courses) which to some extent go halfway to meet the student and save him fatigue and loss of time.

- Second possibility: part-time; training is done partly in working hours and partly in leisure time (classes at the end of the day, classes concentrated into one day of the week, short training courses). There are many possible variants, but these immediately raise problems concerning relations with the employer, for they require his participation - a system which hardly appears to operate at present. Assuming that each firm is prepared to grant staff some time off for this purpose, it would also be necessary, if the system is to work properly, for all firms in the region to release trainees at the same time, or for the same period.

- Third possibility: full-time. From the worker's point of view this is obviously the best solution. Released from his job, he can do his training in the minimum time and under the best conditions for mature, fruitful, intellectual work. Unfortunately, apart from the financial problem this creates for the trainee - and which we shall consider later - it is also the method least likely to be acceptable to the employers, who will not easily agree to release some of their staff for a more or less lengthy period and thus disorganise their services. This difficulty is all the more serious if the staff member in question already occupies a fairly high post. It is, however, the only satisfactory solution at higher levels, in view of the volume and difficulty of the knowledge to be acquired.

What practical conclusion can we draw from all this? A satisfactory method might be to have a voluntary trial period (evening classes or correspondence course for example), not too long (1 or 2 years), during which the worker could test his aptitudes and see whether he had the necessary character. At the end, all those who had come through successfully would be assisted by a part-time or, better still, a full-time scheme (this system is at present practised in the Grenoble IPST).

In any case, we must not rely on just one system, for this cannot suit all cases; a whole range of different solutions must be offered to workers in a region.

There is one period in the life of almost every man during which all obstacles (vocational, family, financial) to advancement disappear, i.e. his period of military service. This may be a little too early in life for our purpose, but it would be very useful if, at least during periods of international stability, an effort were made to put this period of relative inactivity to some intellectual advantage. In 18 months it would be possible to give a man substantial training.

Financial problems are closely linked with the foregoing. While a worker's training may cause earning to be lost which are difficult to compensate (overtime, for instance), it ought not to result in any loss of wages.

Firms' attitudes differ at present, and range from the maintenance of the full wage for all time allowed off to a complete absence of assistance. Some firms retain 50 % of the salary which they pay subsequently if the trainee passes his examinations. Indirect assistance is more common - reimbursement of transport expenses, supply of textbooks or equipment.

No form of training is entirely "without charge" to the firm, even if it is done in the worker's own time, for the day's work or output inevitably suffers from the fatigue of the previous evening's study, and the firm carries a real, though not apparent, burden of staff training.

At present the material (and also moral) situation of candidates for adult vocational training is accordingly mostly dependent on the goodwill, or the possibilities, of the employers, and there will always be some small firms which cannot really afford to be very generous.

It therefore seems essential that aid to workers desirous of improving their skills should be officially codified by law, as it is, for instance, in the U.S.S.R. where the law provides that "persons who succeed in their studies without leaving production, whether they attend secondary schools or colleges of general education, or take correspondence courses, shall benefit during the school year from a working week reduced by one day, or by the number of hours corresponding to one day. During this period they shall retain 50 % of their wages" (1). Only through State intervention can widespread and effective responsibility be taken for these workers (without thereby eliminating private contributions, of course). Responsibility should be accepted after a certain stage in the training. After all, this is only normal, for the training of a country's top level staff is one of the tasks of government. Apart from material effectiveness, such State intervention would have the advantage of protecting the liberty of the individual vis-à-vis his employers.

---

(1) Quoted in reference (II).

State aid of this kind does exist in France, as shown for instance by the grant of compensation for loss of wages to workers holding the Diplôme d'Etudes Supérieures Techniques (obtained through evening classes) and admitted to an engineering college for a one or two years' full-time course to obtain the engineering diploma; this system of aid was introduced following the good results obtained by those who had attended the Grenoble Promotion Supérieure du Travail courses concerning admission to the engineering colleges. The initial financing of this experiment was very generously provided by heads of firms in the Grenoble region, who maintained the wages of trainees.

Let us suppose that, despite all these difficulties, the worker has completed the programme he set himself; he has obtained the training he wanted, he has passed his examinations; but he has still not surmounted all the obstacles, for further difficulties arise after training.

A worker who has obtained a diploma (or merely improved his general and vocational education) has not advanced unless he gets a better job. The university awards the diploma, but it is the employer who grants promotion, and the one does not necessarily follow the other. More serious even is the fact that a break in the worker's activity may mean a break in his contract, and he has to start again in another firm which may not always be a bad thing, incidentally).

This is a vital problem: if the idea of upgrading schemes is to be developed and public approval won over, then the efforts made by the workers must be reflected in an actual improvement in their circumstances. Only very few firms have as yet made definite provision, laid down in the regulations, and known to everyone, for a change in the occupational classification of workers who make their way up the ladder of diplomas obtained through occupational advancement schemes. From this point of view it would certainly be an advantage to associate industrial circles with the organisation of courses and the award of diplomas, so that better information would prevent any hesitancy.

At present, the problem assumes international dimensions and it is essential that the mutual recognition of diplomas be extended to facilitate the free movement of workers. Article 57 of the Treaty of Rome provides for regulations to this effect for the end of 1969, and the basis for a European Register of higher technical occupations have already been laid.

Let us now suppose that these obstacles have been eliminated and that the worker has obtained the occupational classification corresponding to the new skill he has acquired. He has adjusted to his new tasks, but he has not necessarily adjusted to the new social environment in which he will be required to move; and even if the training he has received has prepared him for this change, his family, and particularly his wife, are often not ready for this new life. The "promoted" worker leaves behind his original "knowledge" environment, but seldom does he possess, or simultaneously acquire, the social education corresponding to the environment into which he is to move. Serious difficulties may ensue, and the "promoted" worker may become a "displaced person". The attitude - often reserved - of the environment into which he tries to move may make his position even more uncomfortable; we often prefer those who have followed the normal and reassuring channels of our society, and easily confuse "promoted" and "parvenu". It is striking that our society has less difficulty in accepting the "parvenu" who has got away from his environment because he has become rich, than the "promoted" man who has risen through his intelligence and hard work.

This belongs more to the sphere of sociology than of education, but we thought it desirable, when reviewing all the problems linked with the advancement of the individual, to stress this aspect and insist on the need for total social advancement (including the worker's family). This begins to tie up with the problem of striking a balance between specialisation and general culture, to be discussed later.

c) TECHNICAL AND ORGANISATIONAL PROBLEMS

Let us leave the individual side of the question to turn to that of the institutions, and begin by dividing the problems raised by the organisation of a system of continuous education into a number of questions:

- what should be taught?
- how should it be taught?
- who will teach it?
- what diplomas should be conferred?
- how will the operation be financed?

It is essential clearly to define one's objectives at the outset, that is, the benefits one wants or should obtain for those workers able to profit from upgrading schemes.

There is one trap we must certainly avoid: the apparent easiness of training a specialist, for it is indeed relatively easy and quick to provide an individual with the knowledge which will make him a specialist in a particular technical field.

Specialisation undoubtedly has short-term advantages: the trained man will be immediately usable, he will do his work well, his output will be high. Such training may be justified in special circumstances (developing countries, wartime) but specialisation is dangerous, for the specialist's skill is "perishable". What he gains in the immediate future in a limited field, he loses in the long term in a more general field. In short, he is "cheated".

Specialisation is no doubt necessary (we do not believe in "all-roundness"), but the later it occurs the better the training. A man who has received a good basic training will specialise more easily when the time comes, and can even develop his specialisation or change it altogether if circumstances so require. Premature specialisation is a bad investment.

In view of today's rapid scientific and technical development, the economy now requires persons who are able to readjust continually, or even to retrain. The acquisition of this adaptability is the best guarantee for the worker of being able to make long-term use of his personal gifts, and the best investment for the future of a firm (or nation).

Only a broad, advanced general education can ensure this and provide access to the whole scientific field concerned and to its related fields; such general education is training in the mechanics of reasoning and in the acquisition of knowledge, it is apprenticeship in the art of expression, written and verbal, in one's native or in a foreign tongue; it is initiation into economic and human problems, and into the broad lines of contemporary thought.

Nevertheless, a proper balance must be found; we must not, on the pretext of general education, lose sight of practical requirements, consider only generalities, or yield to the temptation of intellectual speculation, otherwise the result would be the "white shirt" type of technician generally unpopular with the employers and who thinks being a practical operator is beneath him and will not use an appliance without knowing its full mathematical theory. In this connection we must beware of the prestige accorded theoretical knowledge by students.

For problems of general organisation, the most important point is undoubtedly to offer in each region a series of well co-ordinated possibilities providing steady advancement with an adequate number of intermediate stages (even inside the "higher" level).

We shall not revert to the problem of in whose time the courses are attended, but other difficulties also arise. For example: should we offer workers a "set" programme, i.e., a series of compulsory courses logically following each other, or allow them a free choice of the subjects offered and leave it to the candidate to select the subjects he wants and the order in which he will study them. In France, the first method is the one adopted by the Instituts de Promotion Supérieure du Travail, and the second by the Conservatoire National des Arts et Métiers.

Both approaches are defendable, and we think that both should be retained; workers undertaking a full diploma course should certainly be offered a "set" programme to guide their studies along the right lines. But we should not neglect those workers who, for various reasons - occupational or family - although not in a position at that moment to make a long-term effort, nevertheless wish to improve their training in order to "understand" their daily work better (a frequent motivation in the surveys we have made).

They, too, should be able to find in the upgrading schemes what they are looking for, and the courses should be organised accordingly.

Much has been written about teaching methods, and the need to evolve a system for teaching adults, using original methods specially adapted to such audiences. Specialised institutes are carrying out research on this question (INFA at Nancy).

It seems obvious to us that the methods used to teach children or adolescents, cannot be used to teach adults the same subject. But for higher education, which is our main concern here, we do not think that any adjustments are necessary. The students concerned have necessarily already had fairly advanced training and are generally perfectly capable of following higher education of the traditional type. Possibly at the beginning it may be necessary to go a little more slowly to offset any lack of mental training.

On the other hand, teachers should always remember that their students have very little time for personal work and should not expect them to supplement direct instruction by private reading. Students should not have to look up further references on leaving the lecture hall, and the lecture should be easily understood and completely assimilated on the spot. There is usually no time to go over any point which has not been understood.

Two conflicting views are held concerning the diploma conferred. For some, special diplomas should be given for vocational training, for others equal knowledge should be awarded by the same diplomas, regardless of the manner in which such knowledge is acquired, and consequently workers who take adult vocational training courses should obtain the same diplomas as students in ordinary courses.

Those in favour of the special certificate point out that the combination of theoretical training and previous practical experience is of special value, and justifies a distinction between vocational training students and ordinary students who have not their practical background.

On the other hand, there may be a risk that special vocational training diplomas might be regarded as certificates of merit rather than of knowledge.

The Higher Vocational Training Institutes have always upheld the view that the same certificate should be given, and reference has already been made to the fact that their students are admitted to Engineering Schools, which is an excellent illustration of their policy in this respect.

If, as I believe, where diplomas are the same, the vocational training graduate has "something more" than the ordinary student, employers will know which to choose.

In view of the large number of teachers (indicated above) it is obvious that there are not enough teachers in the ordinary schools to meet the need.

Neither is there any question of sufficient teachers being trained in the time available. The load might be spread over to some extent by using such indirect media as television, but engineers and persons employed in industry will certainly have to be used to make up the shortage.

Admittedly, such persons have not been trained to impart their knowledge and all may not have the required temperament to do so. This is probably true, but do all "certificated" teachers know how to teach? Besides, some rapid training in these new duties is not inconceivable.

These new activities to be entrusted to high level industrial staff will probably mean a reduction in the productivity of firms, but there seems to be no other solution.

All those who have some knowledge should feel responsible for training others and to some extent should regard it as their duty to share and spread that knowledge. This is really a civic responsibility, combined with a moral obligation.

Apart from solving the quantitative problem of teacher recruitment, recourse to persons with practical experience of the subject to be taught is also very valuable from the pedagogical standpoint. Such teaching staff will not be permanent and will be continually renewed, thus providing an excellent guarantee that adult vocational training will not fall into a new type of school routine. It is also certain that some subjects, particularly in technological disciplines, will be taught better by those who practise them than by professional teachers who are not so near to reality, and who might possibly be in need of a refresher course themselves.

Lastly, there is the problem of financing. No long comment is needed to demonstrate the vital importance of this problem. Without money nothing can be done, and all this is very expensive.

There are two possible sources of financing - public and private funds.

Industry is already responsible for part of the financing of existing activities. Some firms run their own vocational training schemes and in France 2.25 % of the wagebill is devoted on average to staff training. Moreover, all firms contribute indirectly to the general cost of vocational training through the apprenticeship tax.

Naturally, no contribution of this kind should be terminated, and all should be encouraged, but it is obvious that these efforts, which will never benefit workers in very small firms, are not commensurate with the size of the problems, and that the only solution is Government intervention.

Here all comment is superfluous and we can only express the wish that Governments may become actively conscious of these problems and sufficiently clearsighted to devote the necessary proportion of the national income to them.

To sum up, the points of major difficulty requiring Government intervention are as follows:

- adjustment of working hours
- financial assistance to trainees
- teacher recruitment
- recognition of diplomas
- financing

But however urgent and absorbing the tasks of continuous education may be, they should not make us forget the reforms required in formal education, for which it is no substitute.

+

+ +

Continuous education can bring hope, accomplishment and, in a word, happiness to hundreds of thousands of workers, but also disappointment and bitterness; it may be the expression of a genuine concern for the individual and his freedom, but it may also serve the purpose of the demagogue and the paternalist. We must never forget that it should have a dual objective: to prepare the worker for playing an effective part in the service of the economy, but also to develop his personality in order to produce a free, responsible individual; it must therefore be complete and not provoke disequilibrium or failure.

A great deal of attention is paid to material comfort, but we should also introduce into our preoccupations the concept of "mental comfort". (1) If there is a disparity between the worker's real aptitudes and the nature of his job, such a comfort cannot exist and, after a certain moment in life, only continuous education in some form or another can provide it. Increasing attention is paid - and justifiably so - to "developing" countries, but those who have "know-how", like those who have material resources, should feel a sense of fellowship with those who have not received the same advantages as themselves. To quote Louis Armand once more, "The scale of the problems makes it essential that education should cease to be the privilege of a minority which does not share".

But of course we must not become "sentimental"; continuous education is not a "good deed", it is simply an economic necessity and a social justice, well defined in A. Kaufmann's succinct motto "Valoir pour pouvoir".

BIBLIOGRAPHY

(I) P. DEMONDION : "La Promotion Sociale", Berger-Levrault, Paris 1966

(II) A. KAUFMANN & J. CATHELIN : "Le Gaspillage de la Liberté", Dunod, Paris 1964

(III) Report of the "Comité Consultatif d'étude des aides à la Promotion Sociale",
La Documentation française, No.44, 1963.

---

(1) Reference (II).

ANNEX

L'INSTITUT DE PROMOTION SUPERIEURE DU TRAVAIL DE GRENOBLE
(THE HIGHER VOCATIONAL TRAINING INSTITUTE, GRENOBLE)

The Grenoble Higher Vocational Training Institute (P.S.T.) was set up in 1951 with the tripartite assistance of the University of Grenoble, the Department of Technical Education, and industry. Its courses are intended to enable all persons in employment to acquire a scientific, technical and general education, should they so desire.

ORGANISATION OF EDUCATION AND DIPLOMAS

Courses are held in the evening (7 - 9 p.m.), Saturdays during the day time and sometimes on Sunday mornings (however, for the benefit of students who live some distance from Grenoble, all the main courses are given Saturday).

Courses are composed as follows:

a) A preparatory year to bring students who have not obtained the Baccalauréat up that level in science subjects.

No certificates are required for admission to this preparatory year; at the beginning of the year students are given psychotechnical tests simply to provide them with an idea of their possibilities, but this has no bearing on their admission to the course. At the end of the preparatory year students must pass an examination to move into the first year, and, as soon as they fulfil the age conditions, may sit the special entrance examination for the Science Faculties.

b) A three-year-cycle leading to the "Diplôme d'Etudes Supérieures Techniques" (D.E.S.T.)

- Courses in the first and second years concentrate on basic scientific education in Mathematics, Physics and Chemistry (M.P.C. preparatory course), supplemented by general education in French, English and technical drawing. Admission to the second year is contingent on passing an examination at the end of the first year and requires enrolment at the Faculty for the D.E.S.T. At the end of the second year, students sit the Mathematics, Physics and Chemistry examinations held by the Science Faculty and, if they pass, they can go on to the third year.

- Third year courses provide specialised technical training in common with Faculty students preparing for the D.E.S.T. At the end of this year, students must pass examinations in a technical specialisation, workshop draughtsmanship and technology, and general culture (foreign language and questions concerning social and economic fields and industrial legislation). The technical specialisation taught at the Higher Vocational Training Institute are at present:

- Industrial chemistry
- Electronics
- Electrical engineering
- Engineering (with the following options: engineering construction, hydraulics, soil mechanics)
- Programming

Students who obtain the D.E.S.T. are then admitted to a fourth year of Higher Vocational Training, and the best of them can go to an Engineering School for two years full-time study with Vocational Training fellowships.

c) Lastly, a final course of two (4th and 5th) years allows students to supplement and perfect their scientific and technical knowledge and their general education on the basis of the curricula for "Certificats d'Etudes Supérieures" leading to a degree in applied science. This course includes an examination at the end of the 4th year for admission to the 5th year and a final examination at the end of the 5th year, culminating in the award of degree certificates. The level of knowledge acquired enables the best students to enter the terminal year of the Engineering Schools and to attend the Faculty for a year full-time, with a grant to compensate for lost wages. The 4th- and 5th-year courses include the same sections as the D.E.S.T. specialisations mentioned above.

Apart from this course terminating in a diploma, any paid worker wishing to improve his knowledge in a given field may be admitted to any P.S.T. (Promotion Supérieure du Travail) course.

LOCAL CENTRES AND CORRESPONDENCE COURSES

Local centres providing the same courses as the Grenoble centre are situated in :

- ANNECY (preparatory year)
- CHAMBERY (preparatory year, 1st and 2nd years)
- VALENCE (preparatory year).

Moreover, the P.S.T. organises correspondence courses on first and second year subjects (mathematics, physics, chemistry, French, English), which include an eight-days' full-time course at Grenoble from time to time, when students can meet their teachers and do practical work.

ACCESS TO P.S.T.

- Courses are free of charge.
- There is no age limit for admission to any year.
- An employer's certificate attesting the status of paid worker must be provided.
- With the exception of the preparatory year for which no previous qualification is required, direct entry into subsequent years depends on the presentation of certificates attesting the level of education previously acquired by the student, and possibly after a control examination.
- Higher Vocational Training students are allowed to defer their military service to their studies.

ENROLMENTS AND RESULTS

It is estimated that, for an average first year, i.e. 150 students:

- 100 will go on to the full D.E.S.T. and 70 will obtain it in the usual time (320 D.E.S.T. have already been awarded to P.S.T. students);
- 50 will go on to the end of the 5th year, and every year some 100 degree certificate passes are recorded for all students in the 4th and 5th years;
- 20 will go to an Engineering School and obtain its diploma. It should be noted that P.S.T. graduates going on to an Engineering School usually take the top places in their year.

For some years, total enrolment in the Higher Vocational Training Institute has been about 100 students.

With the exception od the preparatory year, where the extremely broad intake inevitably leads to a drop in numbers during the year, 90 % of the students present at the beginning of the year usually sit the examinations.

The pass rate for the various end-of-year examinations is 60 - 65 % .

SECOND TOPIC

METHODS OF FORECASTING THE NUMBER OF STUDENTS

RECORD OF THE DISCUSSION

Introduction

In most Member countries more or less detailed forecasts of the trend in the number of students attending courses of higher education over the next few years are now available.

The context of these forecasts differs from one country to another. In certain countries they are part of the economic and social planning machinery e.g. in France and Holland. In other countries information as to the number of students likely to require higher education in the coming years has been sought merely to enable the requisite action to be taken as regards financing, construction, etc.. This was the case with the forecasting done in the United Kingdom by the Robbins Committee and in Belgium by the Conseil National de la Politique Scientifique.

The three critical analyses of methods of forecasting student numbers in France, the United Kingdom and Belgium given below were submitted respectively by Miss Dutilh, Mr. Redfern and Mr. Meulepas. These papers led to a thorough-going discussion in which they were compared with the recommendations in the Manual of Methods and Statistical Needs for Educational Planning submitted by Mr. Williams and Mr. Solliliage of the O.E.C.D. Secretariat at a special meeting.

A number of special points relating to forecasting methods were also dealt with in three original papers, i.e. two examples of the analysis of problems in connection with the location of new establishments of higher education were submitted to one of the Working Parties, the first by Mr. Coetsier and Mr. Bonte and the second by Mr. Ruiter. In the second working party Mr. Coetsier outlined a method for measuring drop-outs in university courses and the results of a survey conducted at the University of Ghent.

1. OBJECTIVES IN HIGHER EDUCATIONAL PLANNING

The techniques of forecasting depend on the objectives involved insofar as these affect the choice of the methods to be used. The discussion which followed Mr. Redfern's paper showed the need for a solution to what has often been regarded as two incompatible methods of approach to educational planning i.e. the manpower demand approach and the "social demand" approach i.e. the individual desire to secure a place at the university.

As far as the objectives are concerned it has often been said that there is a conflict between the desire to maintain the principle of the individual's freedom to choose his course of study and the growing need to control the development of the educational system (and more especially higher education) in order to satisfy the community's needs for highly qualified personnel. These two very different objectives call for different forecasting methods: in the manpower demand approach the number of students is deduced from the flow of graduates considered necessary to meet this demand but where "social demand" is given priority forecasts will be based on an estimate of the number of pupils who have reached the end of the secondary cycle and want to go on to higher education. It will also depend on the breakdown of the pupils by branch of study.

It was agreed that this alternative was an oversimplification. According to Mr. Redfern neither forecasts of manpower demand nor the "social demand" spontaneously expressed by individuals can be considered independently of each other. The ideal would be to have a development model of the educational system which provided the maximum amount of (i) the benefit for business firms (manpower demand approach) and (ii) individual satisfaction ("social demand" approach) at least cost. However intellectually satisfying it may be a model of this kind based on best possible cost/benefit ratio is still far from being a practical device on which educational planners might base their decisions, as Mr. Redfern himself acknowledged in the course of the discussion. There are many material difficulties to overcome e.g. how to measure the net contribution of education to economic activity and to individual satisfaction, how to define and measure the non-monetary benefits of education, how to assess the effects on these gains of a change in the present breakdown of workers by levels of skill and a change in the ratio of highly qualified personnel to other production factors, etc. But everybody agrees that forecasts based exclusively on one or other approach entail serious disadvantagss:

1. When they are based solely on estimates of manpower demand, forecasts may well remain without any practical effect unless of course planners are determined to put a strict limit on the number of places available in higher education in the light of these requirements. However, as Mr. Skorov emphasized, there would still be the question of ensuring that graduates took up the jobs for which their studies had prepared them. But as the discussion on structural reform showed, none of the countries represented was prepared to set up a system of compulsory direction.

2. As Mr. Grais pointed out, employment prospects are a determining factor in an individual's decision to take up a particular kind of advanced training in the same way as are his ability and his personal calling. And this is even truer of higher education than of earlier cycles of study. But manpower demand data are the only sources of information which will

enable the individual to make his choice in full knowledge of the facts.

3. The assessment of future demand in the various occupations should give planners a more reliable basis for judgment than the mere extrapolation of past trends when their overall estimates of candidates for higher education have to be broken down by major branch of training. According to Mr. Redfern, one of the weaknesses of the work done by the Robbins Committee is precisely that it did not deal with the problem of breakdown by branch. This was the consequence of the initial refusal to evaluate manpower needs.

Educational planning must therefore aim at striking a long-term balance between the demand for highly skilled personnel for the country's social and economic development and the vocational and cultural aspirations of individuals. Forecasts of number of candidates for higher education must therefore be based on methods which take these two factors into account.

2. CRITICAL ANALYSIS OF CURRENT FORECASTING METHODS

One of the criteria for judging the value of methods of forecasting the size of the student body is to compare forecasts with actual trends.

In the countries represented at the Study session (France, United Kingdom, Belgium and Holland) this comparison revealed divergencies which were sometimes considerable. They arose not only in the breakdown by branch of study or type of institution but also in estimates of the overall numbers of candidates for higher education. In most cases the number of students was under-estimated.

In view of these results there was no doubt about the need to improve the forecasting methods hitherto used. Efforts should be concentrated on two main points:

1) A thorough analysis of the orientation and increase in the number of students in the higher educational system which would describe the dynamic structure of the system more satisfactorily than the extrapolation of overall trends in the size of the student body.

2) The incorporation in forecasting models of the socio-economic variables which govern access to and participation in higher education. It is in fact an awareness of these factors which makes it possible to influence them.

Progress has undoubtedly been made in the various countries in collecting statistics and analysing batches of students and their characteristics (by year of study, age, branch and level of training, etc.) but the description of the annual flow of students into, through and out of the higher educational system is still at an early stage. In the absence of this analysis forecasters have often had to fall back on the extrapolation of past trends in the total student body, as in certain forecasts of the numbers of students in Belgium (1), or of recent trends in enrolment rates by age or age groups, as was done by the Labbardt Commission in Switzerland (2).

In certain countries an initial improvement was made in this method by calculating the number of new entrants from the trend in the rate of flow of students into higher education from the level below. This method was used by the Robbins Committee in the United Kingdom, in the work on the IVth and Vth Plans in France and in the latest Belgian forecasts.

But these assessments have fallen short of reality either because the only figures used related to the total student flow and did not allow for differences in the rate of flow from the different branches of the secondary school system (Belgium) or because adequate allowance was not made for changes within the secondary cycle and their probable effects on the rates of flow (Belgium, United Kingdom, France).

Still more deficient are the methods of calculation used to convert these forecasts of new entrants into figures representing the total number of students and the yearly output of graduates. Here again the different experiences mentioned in the course of the discussions showed that practically no information was available about the academic careers of students between the time of their enrolment and the time they terminate their course of higher education (with or without a degree). The fact is that the looser organisation of studies at this level of training makes it impossible to forecast the numbers of students by the methods of calculation used at lower levels where the obligation to attend classes and sit for examinations at the end of each school year makes it possible (at least in theory) to determine the number of pupils in each year-group who go up, stay down, or leave school altogether.

---

(1) See Mr. Meulepas: "Etude critique des méthodes de prévision des effectifs des étudiants des Universités Belges". (Critical survey of methods of forecasting the number of students in Belgian universities).

(2) Rapport de la Commission Fédérale d'experts pour l'étude d'une aide aux Universités; (Report by the Federal Commission of Experts on a Study on Aid to Universities); Berne, 1964.

Apart from special surveys such as that of Professor Coetsier at the University of Ghent (1) or surveys conducted by the Netherlands Central Statistical Bureau (2) it is difficult in most of the higher educational systems in Member countries to evaluate the average time spent on a course of study by students who drop-out and by those who obtain a degree.

To make good this deficiency it was proposed that the total number of students should be calculated on the assumption that the actual average duration of studies was equal to the ratio observed in the past between the total number of students and the number of new enrolments. This was the method used in the United Kingdom by the Robbins Committee. Other countries which had statistical series with a breakdown of students by age group used these to estimate total numbers. If coefficients of flow for each year of study cannot be calculated it is possible to compile coefficients of flow by age. Past trends in these coefficients are then extrapolated to provide a future figure. This was the method applied in Belgium. But apart from the fact that it does not forecast the number of graduates, this method seems particularly uncertain for higher education since the age distribution of students is very scattered. Nor is allowance made for the frequent counter-currents which check any acceleration in the development of systems of higher education in most Member countries. In several countries there seems to be a tendency for the average duration of studies to lengthen as a result of an increase in the proportion of examination failures or the number of "intermittent" students. This factor is supposed to be partly responsible for the increase in the number of students at the universities. An insufficient realisation of this fact was, in the view of Miss Dutilh, the main reason why the forecasts compiled under the IVth French Plan fell short of reality. Moreover there is a growing proportion of post-graduate students (preparing doctorates or engaged in some other specialisation) and this also tends to increase the average duration of courses and swell the total student body. However, it is important to distinguish and measure the respective influence of these two factors as they obviously have not the same implications for the formulation of future policy in higher education. If the increase in the average length of studies is the result of a deterioration in "educational output", the situation will have be remedied, but if it is due to postgraduate work it may be expected to become more marked in future. Moreover, the rise in the rate of admission to higher education seems in several cases to be accompanied by an increase in drop-out rates and the influence of this on trends in the overall number of students runs counter to the influence of the first two factors.

---

(1) P.L. Coetsier: Etude du rendement, de la déperdition et du coût des études universitaires: Exemple d'une méthode d'analyse (survey of output, drop-out and cost of university studies: example of a method of analysis

(2) A summary of these surveys was published in 1965 by the Netherlands Central Bureau of Statistics under the title: "Analysis of student performance".

Chapter II of the handbook on Methods and Statistical Needs for Educational Planning contains a theoretical chart for the analysis of the student flow into and through the educational system. The basis of this method is that it reconstitutes educational flows in the form of a double-entry table showing the breakdown of stocks of students by educational cycles and branches over two successive school years. The transition coefficients thus obtained link each educational level with the previous levels and make it possible to follow the progress of students through a given level over a period of time. When such characteristics as social origin, ability or previous school career are introduced, these coefficients show "transition probabilities" which enable individual as well as collective forecasting to be attempted. This analysis should be collective but should also deal with the main disciplines (science, arts, etc.) and the various courses of study (preliminary studies, licence, specialised courses or doctorate). Moreover, the calculation of these transition coefficients over a sufficiently long period makes it possible to detect tendencies and observe their development over time.

However, the analysis of student flows by the transition coefficient method must be supplemented by a survey of the factors which affect them and dictate their trends, otherwise this will mean merely replacing the present forecasting methods by procedures which are technically more sophisticated but which would again be an extrapolation of past trends. It should also be noted that the use of a model of this kind calls for the collection of far more complete statistical data than are at present available in most countries. In fact the introduction of a system of "individualised data" seems to be the only satisfactory answer to this practical problem.

ANALYSIS OF FACTORS AFFECTING ACCESS TO HIGHER EDUCATION.

In most countries attempts have been made to evaluate the chances of access of each social group to higher education on the basis of the statistics of the parents' vocational groups but this information has rarely been used in student forecasts either as a factor to be taken into account or in order to rectify the inequalities. Planners would need detailed surveys of all the kinds of disparity (social, regional, etc.) which affect access to higher education, for two main reasons:

1. Such surveys would make it possible to distinguish the factors which had a conclusive effect on the demand for places in higher education in the course of the preceeding period, for it may be presumed that these factors have a predictive value in calculating future trends in the educational system.

2. They would provide educational policy-makers with information as to the variables on which influence could be exerted in order to achieve given objectives. According to Mr. Meulepas one of the main weaknesses of most current forecasts is that they give only a "passive" picture of the foreseeable trend in the number of students but do not provide educational planners with the instruments of action which would enable them to make certain decisions and assess their consequences. This is also the opinion of Mr. Ruiter who concluded his paper by stating that "projections are not the aim of planning".

On the strength of the partial surveys already carried out in certain countries the factors mentioned as likely to influence the demand for places in higher education are the sex of the student, social and vocational category, level of education and income in the student's family, number of children in the family, geographical distance from the teaching institution, religious or linguistic attachments, number of scholarships granted, level of intelligence, etc.

In the course of the discussions reference was made to a number of recent surveys which made use of multiple regression analysis in order to evaluate the respective weight of the various factors affecting demand for education. In the United States, Mr. Brazer and Mr. David showed that the educational level of the fathers was one of the most important of the 13 factors analysed to explain the number of years of study completed by their children (1). On the other hand, the study carried out in Holland by Mr. Ruiter, suggests that socio-professional structure (measured by the proportion of senior executives and professional people in the active population in each region) is a predominant factor in regional differences in rates of admission to the classical type of secondary education.

---

(1) Harvey E. Brazen and Martin David: "Social and Economic Determinants of the demand for education: in Economics of Higher Education, US Department of Health, Education and Welfare, Washington, 1962.

In another important study on the part played by the geographical position of higher educational institutions, Mr. Ruiter concluded that the decision to build a new technological university at Eindhoven resulted in a redistribution of students between that University and the University of Delft but that it had only a negligible effect on the increase in the number of students from that region. Distance from the University would not therefore appear to be an obstacle to access to higher education. This conclusion however is a provisional one as there will be a time-lag in the reaction in the area to the presence of this new institution.

In Belgium, Mr. Coetsier and Mr. Bonte have attempted to relate the average intelligence level observed in each administrative canton (measured by military service tests) to the level of school enrolments in the population (1): This survey showed that in certain regions (particularly in the Provinces of Antwerp and Limbourg) untapped "reserves of ability" were particularly large. It was emphasized during the discussion of these various studies that international comparisons of general educational statistics should be healed with the greatest caution. On the other hand a comparative survey of disparities (social, regional, etc.) as regards access to higher education would be most valuable.

Moreover, as Mr. Redfern pointed out, the rates of access to higher education actually observed cannot be considered as a valid indication of the demand for places. The latter obviously depends on the number of places offered in institutions of higher education and the rates of access observed therefore reflect a country's educational policy, the aspirations of individuals and the view they take of their chances of gaining admission. This is particularly true when there is a system of selection or competition for entry to institutions of higher education. The demand for places is also partly affected by the prospects of employment offered to graduates in the various disciplines, and it may be said that each individual works out his own "employment forecast" when he decides whether or not to apply for higher education.

But even assuming that the variables which have a decisive effect on the demand for places in higher education can be determined by planners with a sufficient degree of accuracy, it would be much more difficult for them to estimate the effect on demand of the reforms recently introduced into the system of higher education or the stages leading up to it.

---

(1) P. Coetsier and A. Bonte: "Nouveaux aspects du problème de l'expansion géographique des établissements d'enseignement supérieur" (New aspects of the problem of geographical expansion of institutions of higher education.)

For example, one would like to know what the repercussions of the Act of 1964 will be on trends in the number of enrolments at universities. This act enables new categories of holders of secondary school diplomas in economics, teacher training and technical subjects to gain access to university education and at the same time introduces a "maturity examination" for all holders of secondary school diplomas wishing to study subjects for which "statutory diplomas" (for which the syllabuses and examination conditions are specified in the Act) are awarded. An identical problem has arisen in France with the introduction of reforms in secondary education (institution of collèges d'enseignement secondaire, changes in the baccalauréat) and in higher education (creation of instituts universitaires de technologie, changes in the structure of science and art courses). This reform, which was begun in 1959, will not be completed until some time in 1969. For this reason, when forecasts of students requiring higher education were compiled for the Vth Plan (1966-70) a mere extrapolation of the tendencies observed in the past, particularly rate of flow between secondary and higher education and average duration of studies was found to be inadequate. It often proved necessary to resort to conjecture without being able to rely on a body of observed facts.

The problem is still more delicate when it comes to long-term forecasts and allowance has to be made for the repercussions of reforms which will not be introduced until the forecasting period is well under way. How, for example, is it possible to measure the effects of the decision to raise the school leaving age to 16 (planned for 1971 in Great Britain and 1972 in France) on the number of enrolments in higher education in those countries between 1975 and 1980?

THE ADVANTAGES OF A SYSTEM OF INDIVIDUALISED DATA

Improving forecasts of the number of students taking courses in higher education does not depend solely on improving forecasting methods. Mr. Meulepas' paper showed that very sophisticated projection techniques do not necessarily ensure greater accuracy than the mere extrapolation of general trends if adequate basic statistics are not available. Moreover, even when investigations into the factors affecting access to higher education exist they cannot generally be used directly by planners either because they cover only a portion of the student population in a single year (surveys conducted under the auspices of a particular institution) or because their results cannot be directly compared with existing educational statistics. As was seen above, the actual organisation of higher education makes it difficult to analyse the flow of students over a given period and consequently to calculate the parameters (transition coefficient, average duration of studies, etc.) required in order to work out forecasts of student numbers at this level.

The position will be radically altered with the adoption of the system of "individualised data" now being planned or gradually introduced by several countries. This system, which is described in the O.E.C.D. Statistical Handbook, would enable each student to be kept under review throughout his educational career. An application of this system to France was submitted to participants by Madame Solliliage of the O.E.C.D. Secretariat. It has gradually been introduced into science faculties since 1965 and will be extended by stages to the whole of the French higher educational system. At his initial enrolment each student will be given an identification number which he will retain throughout his period of study and which will form the basis of the individual index cards he fills up at each stage in his educational career.

Two types of index card are used i.e. for enrolment and for examinations. The enrolment cards record three kinds of information:

- personal information (name, sex, age, nationality,etc.) and socio-professional details (father's occupation, type of family accommodation).
- information on the student's previous educational record;
- type of course for which the student is enrolling.

Each time the student registers for a new stage in his studies further details will be added to the information on the cards. The identification number is given to each student by the Institut National de Statistique (INSEE), and will be gradually used for all other administrative purposes. Certain participants regretted that the questionnaires do not mention such interesting details as parents' educational level, family income, scholarship awards, etc.

One of the advantages of the system of individualised data is that it will now be possible to follow the careers of "any cohort of students and study the effects of a large number of variables". The processing of these data at national level will provide a solution to the problem of double enrolments and transfers of students from one institution to another. The latter factor used to make it very difficult and even impossible to estimate accurately the percentage of students who drop out or who complete their course successfully. It will also enable each institution or establishment to conduct its own research on the same basis as the research done at central level and thus see where it stands in relation to the national average. The fact that the identification number is issued by INSEE might perhaps make it possible to follow the progress of the student after he has completed his course (the number might for example be repeated on the National Insurance card). The card index might serve as a sampling basis for subsequent surveys, e.g. on the relation between the student's subsequent profession and the type of training he has received.

It will then become worthwhile to ask those concerned to complete a form periodically. The student's identity number need only be passed on to the statistical service by the educational establishment at each stage in the student's educational career, i.e. new enrolment, re-enrolment, examination, etc.

A number of other countries are introducing similar systems, particularly Germany, Sweden, Denmark and Greece. In Belgium, an index of individual students has existed since 1936 but all the analytical potentialities it offers do not appear to have been utilised. In Holland individual card indexes have already been used as the basis for many surveys of the characteristics of students at various educational levels. Reference has already been made in the present report to an analysis of educational output at secondary and higher levels. Other surveys have been designed to determine student enrolment in higher education on the basis of their geographical and social origin (1). An attempt is now being made to extend this system to teachers by transferring the information on nominal rolls of teachers to individual card indexes. Annex II of the Handbook on Methods and Statistical Needs for Educational Planning gives an idea of the methods used and the preliminary results achieved in the Netherlands.

Once this system has been introduced into a sufficient number of countries it will be able to provide a basis for very valuable comparative international surveys.

---

(1) Overgang v.h.m.o. -(Transfer general secondary to higher education on a regional basis) - hoger onderwijs, regionaal bezien, 1957-1959: Centraal Bureau voor de Statistiek, 1962.

- De Sociale en regionale herkomst der studenten bij het hoger onderwijs, 1958-59: Centraal Bureau voor de Statistiek, 1960.

- De Sociale en regionale herkomst der studenten bij het wetenschappelijk onderwijs 1961-62: Centraal Bureau voor de Statistiek, 1965.

FORECASTING AND PLANNING THE NUMBER OF STUDENTS IN HIGHER EDUCATION

by
Philip Redfern

1. This paper is divided into two parts. The first part begins by describing the projections and plans which were prepared in 1963 by the Committee on Higher Education (the Robbins Committee) whose task was to review the pattern and development of full-time higher education in Great Britain. There follow some comments on the extent to which the actual development of higher education, since the Robbins Report was published, has been in line with the Report's recommendations. The second part of the paper discusses ways in which the methodology embodied in the Robbins Report might now be extended and improved. This part concludes with some suggestions of a theoretical character on the criteria and methods for planning the expansion of higher education.

I. The Robbins Report projections

2. The Committee on Higher Education which sat from 1961 to 1963 under the chairmanship of Lord Robbins represented a landmark in the planning of higher education in Great Britain. The Report and its 5 appendices contain a wealth of statistical material including a detailed description of the methods which the Committee had employed in order to arrive at their projections and recommendations on the expansion of higher education. In this context higher education was taken to include university institutions, teacher training colleges and those courses in technical, commercial and art colleges which are designed for pupils who have successfully completed the full secondary school course to age 18 (or have obtained equivalent qualifications in other secondary level institutions).

OBJECTIVES OF HIGHER EDUCATION

3. The Robbins Committee began by identifying the objectives of higher education. The principal objectives may be listed as follows :

i) Social demand: The desire by the individual or his parents to have higher education, either for its own sake or for the employment opportunities it opens up, or is thought to open up. Related to this is the objective of society which the Robbins Report described as "the transmission of a common culture and common standards of citizenship".

ii) Manpower demand: The needs of the economy for manpower with various levels of qualifications in the different disciplines.

iii) Extending the boundaries of knowledge through research.

In theory, planning higher education involves a study of all these objectives, including an assessment of them in qualitative and quantitative terms, and the resolution, using appropriate criteria, of the inevitable conflicts between them. Moreover, the cost of providing higher education must be brought into the scales in preparing future plans.

4. The Robbins Committee acknowledged the importance of the manpower approach to educational planning but decided that, with the exception of a special exercise that they did on teacher supply and demand, the method was not generally practicable. This was because the statistical data were inadequate and the problems of forecasting were too intractable. The Committee therefore produced their projections and recommendations for the expansion of higher education on the social demand approach alone. Their basic philosophy was that places should be provided in higher education for those able and willing to benefit from it. So far as the costs of higher education were concerned, the Committee calculated what expenditure would be involved in the expansion they recommended. But, in the absence of any satisfactory method of calculating the return on this expenditure considered as an investment they confined themselves to arguing that if the nation desired the proposed expansion the resources to finance it could be found.

PROJECTIONS OF "SOCIAL DEMAND"

5. In quantitative terms, then, the Robbins Committee's recommendations on future numbers of places in higher education boiled down to projections of the numbers of young people who would achieve the necessary qualifications for entry to higher education and would wish to enter. The first step in the calculation was to examine past trends in the proportion of young people who stayed on at school beyond the minimum school leaving age to the age of entry to higher education (at around age 18) and who acquired the necessary school leaving qualifications. In fact, the minimum entry qualifications for different types

of higher education institution vary: for universities they consist of passes in the General Certificate of Education (G.C.E.) at 'A' (advanced) level in two subjects, whilst for teaching training colleges passes at the 'O' (ordinary) level of G.C.E. in five subjects is sufficient. Study of the statistics showed that an increasing proportion of each successive school cohort was leaving with appropriate qualifications, but no study in depth was made into the factors underlying this increase. The proportion was projected forward into the future broadly on a straight line basis. The table following shows figures for the recent past, together with the latest projection published two years after the Robbins Report, both in terms of proportions of the relevant age group and in terms of actual numbers of individuals.

Table 1. FLOW OF PEOPLE WITH MINIMUM G.C.E. QUALIFICATIONS TO ENTER HIGHER EDUCATION

England and Wales

		5 or more 'O' levels (1)		2 or more 'A' levels (1)	
		Percentage of the relevant age-group	Numbers (thousands)	Percentage of the relevant age-group	Numbers (thousands)
Actual	(1955	11.2	64	4.6	26
	(1956	11.7	66	4.8	27
	(1957	12.4	69	5.3	30
	(1958	13.2	74	5.7	32
	(1959	14.1	80	6.2	34
	(1960	14.8	90	6.6	38
	(1961	15.3	98	6.9	43
	(1962	15.4	105	7.6	51
	(1963	15.9	113	8.0	53
	(1964	16.6	123	8.3	61
Projection	(1965	17.0	134	8.7	68
	(1969	20.1	134	11.3	74
	(1973	22.5	152	13.0	85
	(1977	24.4	185	14.7	107

Source: Statistics of Education 1963 and 1964.

(1) Figures for 5 or more 'O' levels exclude, and those for 2 or more 'A' levels include, the flow of people obtaining C.G.E. qualifications in technical and commercial colleges. Most of the people shown in the two right-hand columns are also included in the two left-hand columns.

Note: In this context the relevant age group is not a single age group but an amalgam (i.e. a mean) of the several ages at which pupils leave school with the qualifications in question.

The small increase between 1965 and 1969 in the estimated number of people obtaining qualifications reflects an increase in the proportion of the relevant age group off-set by a fall in the size of the age group due to the passage of the postwar "bulge" in the birthrate. This pause in the growth of potential entrants to higher education has come to be known as the "plateau".

6. The basic Robbins philosophy for their projections was, as previously mentioned, an assessment of the numbers able and willing to enter higher education. But the Committee had little evidence of the willingness factor. In the United Kingdom there is no tradition of a right to a university place for a school leaver with the necessary minimum academic entry qualifications, in contrast to the situation in many European countries. The same is true of teacher training colleges though for technical and commercial colleges the "open door" principle has been more applicable than in the other British institutions of higher education. It was because figures of past entry into higher education reflected in large measure the places provided by the authorities that they threw only a limited light on the demand for places, i.e. on the extent to which qualified school-leavers applied to enter.

7. What the Committee did was to note the fact that the past entry to university institutions, expressed as a proportion of the flow of young people with the minimum entry qualification, had been falling during the second half of the 1950's. It interpreted this, not as a fall in the application rate but rather as indicating increasing competition amongst the applicants for the limited number of places provided. The Committee argued that the competition for entry should not become any greater in the future and should, at any rate later on, become easier. The Robbins "able and willing" formula was therefore translated into the following terms:

$$\text{Entry to higher education} = K \times \text{flow of young people with appropriate qualifications,}$$

where K was to remain constant at the 1961 level up to 1967 and was then to be increased by a factor of 1.1, the increase being spread over the five-year period to 1972 - roughly the period of the "plateau". Because two different levels of entry qualification were considered the formula became essentially:

$$\begin{aligned}\text{Entry to higher education} = {} & K_1 \times \text{flow of people with first qualification} \\ & + K_2 \times \text{flow of people with second qualification.}\end{aligned}$$

It may be noted that, because the K's are less than 1, neither of these formulae provides that every young person who is able and willing shall have the opportunity of a place in higher education: the original philosophy of "able and willing" had been changed.

8. The projected entry to higher education may be converted into projected numbers of students by means of suitable assumptions on the length of courses in the different institutions. The Committee's recommendations for full-time student places in England and Wales were as shown in Table 2 below. Separate projections were made for Scotland.

Table 2. ROBBINS' PROJECTION OF FULL-TIME STUDENTS IN ENGLAND AND WALES

(thousands)

	Entry (1)	Number of places (1)
1961	51	163 (2)
1965	75	248
1969	78	291
1973	93	335
1977	112	406

(1) Entry figures exclude, and places figures include, overseas students.

(2) This is made up of 103 thousand places in universities and colleges of advanced technology, 36 thousand in teacher training colleges and 24 thousand in technical, commercial and art colleges.

---

9. The Robbins Committee also made recommendations on how the total number of places in higher education should be divided between the three main types of institutions - universities, teacher training colleges and technical, commercial and art colleges. Its formula was essentially empirical. So far as universities were concerned, the proportion of young people with the minimum entry qualification who would enter university was assumed to remain constant until 1975, after which it was assumed to rise. Entry to teacher training colleges was to be expanded at a faster rate than would be required by the growth in the flow of people with the minimum entry qualifications, with the object of making good the persistent shortage of teachers in primary and secondary schools by the latter part of the 1970's. Having fixed its recommendations for the total entry to higher education and for entry to universities and teacher training colleges, the recommended entry to technical, commercial and art colleges was in the nature of a residual calculation; entry to these latter institutions was, in fact, to grow, in percentage terms, at about two-thirds the rate of

growth in the flow of young people with relevant G.C.E. qualifications. The Committee made no study in depth of the subject specialisms which should be provided for in the various institutions, because, presumably, this would have depended heavily on calculations of the demand for different types of highly qualified manpower, which the Committee did not undertake.

COMPARISON OF ROBBINS PROJECTION AND ACTUAL OUT-TURN

10. I shall summarise very briefly what has happened to the numbers of students entering higher education in the few years since the Robbins Report was published and the Government of that time accepted its recommendations on the expansion in the number of student places.

a) The numbers of young people obtaining appropriate qualifications for entry to higher education have grown more rapidly than was envisaged in the Robbins Report and a new and higher projection has since been published (Table 1). This would involve a consequential increase in the number of places needed in higher education if the Robbins formula continued to be accepted and was re-worked.

b) Finance for university expansion, both on current and capital account, is largely provided by the Government and Government grants to the universities have been tied to the number of university places recommended in the Robbins Report. Up to the present the numbers of students entering university have remained a little below the Robbins recommendations.

c) Entry to teacher training colleges has been further accelerated beyond the Robbins' recommendations in order to improve the teacher supply prospects.

d) Entry to advanced courses in technical, commercial and art colleges reflects, to a larger extent than for the other two sectors of higher education, the pressure of student demands for places - in some cases demands from those who have failed to get into a university institution. Entry has grown much more rapidly than was envisaged in the Robbins Report.

e) Total entry to higher education has exceeded the Robbin's recommendations.

The situation is set out in Table 3.

11. The Robbins Committee's deliberations and the very considerable exercises which supported them were in the nature of a special exercise of unprecedented magnitude so far as the planning of higher education in Britain was concerned. It was perhaps inevitable that a piece of planning mechanism on this scale could not be kept alive at least without a breathing space. In the years since the Robbins Committee reported, a great deal of further work has been done in building up the basic statis-

tics which are an essential prerequisite for a satisfactory planning machine. We have continued to update the projection of qualified school leavers, which is an essential ingredient in the Robbins-type exercise, but policy decisions on the expansion of student places in higher education have been taken in considerable measure ad hoc. The Secretary of State has now announced his intention to create a Planning Division within the Department of Education, and one of its functions will presumably be to keep under review the projections and plans for the expansion of higher education, so carrying on and developing the work initiated by the Robbins Committee. It is perhaps appropriate, therefore, at this point of time, for me to make one or two comments on ways in which the Robbins projections and plans might be extended.

II. DEVELOPMENT OF METHODOLOGY

A FORECASTING MODEL OF THE EDUCATIONAL SYSTEM

12. The kinds of estimates that I have discussed for higher education can be formalised into a projection or forecasting model covering not only students in higher education but all sectors of the educational system, both students and teachers; and indeed it is necessary for completeness to include that part of the population that is not engaged in education either as students or teachers. A merit of such a model would be that the projections for higher education would be related to, and articulated with, projections for other sectors of education, i.e. the inter-dependence of the growth of different sectors of education is properly taken account of. The model framework identifies the different educational processes (e.g. primary school, teacher training colleges and teachers in primary school) and they may be numbered 1, 2, ... (k - 1), regarding the sector for individuals who are not in education either as students or teachers as the kth process. We now write n(r,t) as the number of students (or teachers, as appropriate) in the rth process at time t for each of the values of r from 1 to k; p(r,s,t) as the proportion of the individuals in process r at time t who, at time (t + 1), have moved to process s; p(r,k + 1, t) as the proportion of the individuals in process r at time t who, at time (t + 1), have left the system by emigration or death; and f(k + 1, s,t) as the number of immigrants and births entering process s in the time interval (t, t + 1).

This yields the reccurence relationship:

$$n(s, t + 1) = \sum_{r=1}^{k} p(r, s, t) \cdot n(r, t) + f(k + 1, s, t)$$

The n's represent stocks of students and teachers; the p's represent the proportions in which individuals in one activity move to other activities (or emigrate or die) during the unit time interval t to (t + 1) - normally a year, and the f's represent the number of people entering the system from outside by immigration and birth. Examples of the transition proportions p are the proportion of students of the last compulsory school age (14 in the United Kingdom) who stay on at school voluntarily to age 15 and the proportion of new graduates from universities who enter teaching. From the recurrence relationship just set out we can work out the numbers of individuals in the different parts of the educational system at any future time if we are given (i) the numbers in the different processes at the present time, together with (ii) the values of the transition proportions p in respect of all possible flow movements and for future times and (iii) numbers of entrants into the system from outside.

13. The Department of Education and Science, in conjunction with the Unit for Economic and Statistical Studies in Higher Education at the London School of Economics, are attempting to do this sort of exercise, though without, as yet, a positive outcome. The model structure chosen has identified about 80 educational processes, each subdivided according to the sex and ages of the individuals participating in it. A main difficulty has been to assemble the necessary data about the present and recent past, particularly data on flows within the system and hence on trends in the transition proportions. It has proved necessary to make extensive assumptions about these flows and trends. The data demands of such a model are so extensive that we are unlikely to be anywhere near meeting them until we introduce a system of "individualised data" (I.D.) on the lines outlined in the OECD "Handbook of Statistical Needs for Educational Investment Planning".

FACTORS INFLUENCING TRENDS IN TRANSITION PROPORTIONS

14. Even when adequate data about present and past stocks and flows of individuals in the educational system become available, the problem of how to make realistic assumptions about the future transition proportions remains. Can we do better than assume straight line growth in the transition proportions? This would imply that the factors influencing the proportions will change in the future at the same average rate as in the recent past. This question arises whether we are considering a comprehensive model of the type just described or

Table 3. ENTRY TO FULL TIME HIGHER EDUCATION IN ENGLAND AND WALES

Comparison of Robbins' forecasts and recommendations (R) with actual achievement (A)

(i) Flow of people with minimum G.C.E. qualifications to enter higher education

(in thousands)

	5 or more 'O' levels (1)(2)		2 or more 'A' levels (1)	
	R	A	R	A
1961	101	101	43.3	43.3
1962	110	108	47.4	50.8
1963	120	117	49.9	53.3
1964	132	127	55.5	60.6
m965	140	138 (3)	64.3	68.0 (3)

(1) Includes allowance for people obtaining GCE qualifications in technical and commercial colleges

(2) Includes almost all those in the right-hand pair of columns

(3) Projection made in 1964.

(ii) Entry of students (other than overseas students) to full time higher education

(in thousands)

	Universities (including CATs)		Teacher Training Colleges		Technical, art and commercial Colleges		Total	
	R	A	R	A	R	A	R	A
1961	27.3	27.3	16.3	16.3	7.6	7.6	51.2	51.2
1962	29.8	29.1	17.3	17.1	8.1	9.5	55.2	55.7
1963	31.5	30.4	19.6	20.8	8.4	11.6	59.5	62.8
1964	35.6	34.1	22.4	24.1	9.0	12.8	67.0	71.0
1965	40.3	40.2	24.6	28.7	9.9	14.8	74.8	83.7

iii) Ratio of students entering universities (including CATs) to flow of people with minimum entry qualifications

(in percentages)

	R	A
1961	63	63
1962	63	57
1963	63	57
1964	63	56

are engaged on the more limited problem of the entry to higher education using the Robbins Committee's approach.

15. In the latter case we have to consider the growth in the proportion of pupils staying on in school beyond the minimum school leaving age to gain appropriate school leaving qualifications, and the trends in application rates, and entry rates, to higher education. The factor influencing these proportions and the trends in them are many and various. Studies have been shown that the proportions of individuals who stay on at school and later enter higher education vary greatly according to the environment in which the individual is: for example, parental occupation and income, parental education, family size and area of residence. The transition proportions in question might, therefore, be regarded as the dependent variables, with these other social and economic factors as the independent variables. This approach could lead to an improvement in the method of projecting the transition proportions, but would be valuable only if one could forecast the future values of the independent variables which were chosen. For example, we might be obliged to make estimates of the future proportion of the population belonging to each socio-economic group, and this would present new difficulties. Up to the present we have not followed these lines of development in the United Kingdom and have not collected regular statistics on the educational achievements of individuals in relation to their parental background and social environment.

16. The transition proportions (e.g. numbers staying on in school and entering higher education) may vary not only because of the social, economic and environmental factors of the type just mentioned but also under the impact of policy changes; for example, changes in students' grants or in the minimum qualifications which are required to enter higher education institutions. If we are considering a projection, as distinct from a plan, we need to make suitable assumptions about policies - but, more than this, we have to estimate the impact of any changes. This can be especially difficult in the absence of knowledge of the impact in the past of any similar measures. Thus in Britain we do not know the extent to which raising the school leaving age in 1971 to age 16 will react on those children who, even without the new legislation, would have stayed voluntarily to age 16, but who may, in the new situation created by the changed school leaving age, stay on still further.

REAPPRAISAL OF THE ROBBINS REPORT'S APPROACH TO SOCIAL DEMAND

17. I would now like to raise a more fundamental question. Do forward estimates of the type embodied in the Robbins projections, or in the forecasting model which I have just described, really reflect "social demand"? I suggest the answer to this question is that the projections reflect social demand

only in part. The figures of past participation in education beyond the minimum school leaving age, and in higher education in particular, presumably represent the resolution of past conflicts between social demands, manpower demands, and costs. It follows that any projection based on past participation figures cannot merely reflect social demands. If, for example, cost considerations have been dominant in the past, so that the number of places taken up in higher education has reflected the restricted number of places provided by the authorities, it is obvious that the projection will not reflect social demands. Past participation will in part have also reflected past manpower demands. Thus manpower demands will have influenced participation directly, as for example through the provision of places in teacher training colleges and trainee teacher grants; or indirectly, through the social demand mechanism, by changing individuals' assessments of their future employment prospects if they take a university education. To the extent that this is so, a projection of past participation will represent a projection of past manpower demands rather than of social demands. It seems to me therefore that a projection of past participation is fundamentally quite different in principle from a projection of social demand.

18. This discussion leads one to ask oneself whether one can identify separate future social and manpower demands, quite distinct from any projection of past participation rates in higher education. And if one can, how can these estimates be used for educational planning purposes? In particular, how can the conflict between them be resolved bringing into account also the restraining influence of the cost of providing education? I would like to offer a theoretical framework for discussion.

SOCIAL DEMAND FOR EDUCATION: A SUGGESTED APPROACH

19. At the present point of time a number of student career possibilities open up in front of each individual, particularly (but not exclusively) if he is young: he may carry on his education to one of a number of possible levels and specialise in one of various subjects; or he may resume an education previously terminated. Some career routes will be more acceptable and some less acceptable to the individual or to his parents. I shall take it as an axiom that the level of acceptability, or unacceptability, of a particular student career route R to an individual i can be measured in monetary units as a lump-sum benefit, (i.e. a dicounted future income or welfare), to be written as b (R,i), a high figure representing a desirable route and a low (or negative) figure representing an unacceptable route. In this way a social demand function b may be postulated with a particular education provision, i.e. the sum of b (R,i) for all individuals i in the community.

20. A number of comments need to be made. Firstly we may confine our attention to student routes which are within the capabilities of the individuals concerned. My second comment will be put in the form of a question. Can, and should a distinction be made between (i) the acceptability of a prospective career route measured now, i.e. as seen from the starting-point; and (ii) an estimate (made now) of how acceptable being on the route is likely to prove at all points of time in the individual's future, i.e. future acceptability, aggregated (and discounted) over time, but estimated now? Certainly, to John, aged 12 who wants to be an enginedriver (or astronaut), the acceptability now of a particular educational route could well differ from his elders' current assessment of how acceptable to John that route would later prove to be, (though it could hardly differ from his own current assessment). This suggests that it may be the second concept (ii) that we are more concerned with.

21. The third comment is important. I have not postulated that, for each individual, there is a unique educational route which he aspires to follow. By associating a benefit b (R,i) with each feasible route, the formulation in effect provides a scale of preferences. Recognition is given to the fact that Henry would be just as happy studying modern languages at Bristol as classics at Oxford, and wouldn't really be too worried to find himself at a teacher training college.

22. Fourthly the social demand function, as I have defined it, associated with a particular scale and subject mix of educational provision is dependent on the allocation of individuals to the places provided in the different courses. Thus, the benefits to individuals of filling 1,000 university science places and 1,000 university engineering places are higher if the selection procedure allots to the science places individuals whose first preference was science and allots to the engineering places individuals whose first preference was engineering - rather than if the science-minded students are allotted to the engineering places. Thus the educational system must not only try to meet social demands in terms of total numbers of different types of student place but must also employ efficient selection procedures.

23. A final comment on the proposed definition of the social demand function: should it be restricted to the demand by the individual for education for its own sake, or should it also embrace that part of demand from the individual which essentially reflects the prospective employment opportunities which education opens up, or is thought to open up? Indeed, are these concepts separable? To the extent that they are it might seem preferable to limit the social demand function to the first element and attempt to handle the second element through the manpower demand function described next.

24. The social demand function, as defined, takes account of individuals' preferences. It may be necessary to supplement it by a further function referring to the benefits which society as a whole anticipates as a result of any specified educational programme.

MANPOWER DEMAND FOR EDUCATION

25. In any future year there are a number of possible patterns of deployment of qualified manpower. The alternatives arise for two reasons: firstly because of the different ways the educational system may develop between the present time and the future time t, thus giving rise to different mixes of people with various types of qualification; secondly because, given the manpower mix, there are different ways of deploying individuals to the jobs available. Some of the manpower patterns will be more acceptable to the economy and some less acceptable. I shall postulate a second axiom, viz. that the acceptability to the economy of any of the alternative patterns can be measured by a benefit in monetary units; this benefit, though it refers to a future time t, is estimated now. A high figure represents a desirable pattern and a low (or negative) figure an undesirable pattern. A manpower demand function b_m may now be defined, in respect of each of the possible ways in which manpower deployment may develop over time, by aggregating and discounting over time the benefits referred to, i.e. :

$$\text{manpower demand function } b_m = \int_t e^{-at} \times (\text{benefit at time } t)$$

where a is a discounting rate.

26. Two comments on the manpower demand function are analogues of similar comments on the social demand function. The proposed treatment of manpower demand does not assume that there is a uniquely defined manpower requirement. Instead the manpower demand function provides a scale of preferences. This gives recognition to the fact that, say, a history graduate would be as acceptable for a particular management job as a graduate in the social sciences, or that two extra technicians at the margin might be worth one technology graduate.

27. The manpower demand function b_m has, in principle, two elements: one dependent on the way the educational system develops in the future and the other dependent on the efficiency with which the available manpower is deployed. This statement corresponds to the earlier remark that the social demand function b_s had two elements: one dependent on the way the educational system develops in the future and the other dependent on the efficiency of the student selection procedures. One way of increasing the benefits to individuals, as represented by the social demand function b_s , would be to improve student

selection procedures; just as a way of increasing the benefit to the economy, as represented by the manpower demand function b_m, would be to improve manpower deployment. In the rest of this paper these opportunities are ignored and the selection/deployment elements in b_s and b_m are assumed to be constant.

AN OVERALL PLAN FOR EDUCATION

28. With the simplifying assumption in the last paragraph, the social demand function b_s and the manpower demand function b_m can be regarded as dependent on the educational expansion programme: this latter phrase covers not only the rates of expansion of the different parts of the educational system but also details such as subject orientation. We can assign a variable j to indicate the selection of one of a range of possible educational policies, so that future educational expansion is a function of j. Hence we can write the social and manpower demand functions as $b_s(j)$ and $b_m(j)$. We can also cost the different developments in ordinary financial terms, using a suitable discounting factor when aggregating the costs over time. Write this as $c_f(j)$. This leads us to the total benefits less cost, viz. :

$$B(j) = b_s(j) + b_m(j) - c_f(j)$$

In principle one policy may be chosen from amongst the alternatives represented by the j's, namely the policy which maximises this total benefit less costs.

29. This approach ignores many difficulties of which I will mention a few. An economist would note that the formulation has made no references to the impact of the price of manpower (i.e. salary and wage rates) on the manpower demand, or the impact of the price of education (i.e. fees and student maintenance costs) on the social demand; nor of the impact of a manpower mis-match on the equilibrium of the wage and salary structure.

30. The range of possible ways in which the educational system might develop has been assumed as given, the problem being one of selection from amongst the given possibilities. But it would be a difficult task in practise to establish the range of possibilities, i.e. to identify which parts of the educational system (e.g. which transition proportions) were subject to control and within what limits; and furthermore to identify the nature of the control instruments. There is a distinct possibility that the selected range of possibilities would be too circumscribed by convention.

31. There is a fundamental difficulty in framing the social and manpower demand functions. Taking first manpower demand, the acceptability of a manpower pattern in year t is very dependent on the manpower patterns that have existed during the preceding years t-1, t-2, ... This is because the economy will in considerable measure adapt itself to the situation it finds itself in. Thus the acceptability of employing 10,000 mathematicians in year t would be entirely different if the economy had adapted itself to working with 7,000 in the preceding years, as compared with the situation where it had conditioned itself to working with 15,000. This suggests that in assessing the acceptability of different future patterns of manpower we should consider patterns of development through time, rather than attempt to isolate the pattern of a single future year. (A less helpful way of making the same point is to state that manpower demand is conditioned by past and prospective supply of qualified manpower, so that one of the data in the problem, viz. the future manpower demand, is dependent on the solution to the whole problem, viz. the way in which the education system will develop. This leads to an iterative problem).

32. On the social demand side the analogous point is that the acceptability to an individual of a particular education route is conditioned by the milieu in which the individual finds himself. The desire by an 18-year old boy to proceed to a university will depend in substantial measure on whether there is an established practice - a tradition - for boys from the school to proceed to the university, and on whether the boys' parents went to university. This suggests that the educational preferences of one individual cannot be assessed separately from the preferences of his contemporaries and his predecessors.

33. The remarks of the last two paragraphs may be summarised by saying that both social demand and manpower demand have elements of continuity, as a consequence of the way in which society and the economy adapt themselves. This suggests that there is perhaps more to be said for simple projection methods than might appear at first sight.

CONCLUSION

34. An approach along the lines set out in Part II of this paper seems to me to have certain merits:

i) It does not rest solely on one approach, either social demand or manpower demand, but takes both into account.

ii) It does not identify the projection of past participation rates as equivalent to the social demand approach.

iii) It does not assume that either social demand or manpower demand are uniquely defined, but recognises that different patterns may be equally acceptable and desirable, i.e. allows for substitution.

iv) It does not ignore costs but brings these into the balance.

In most of these respects the approach differs from the Robbins projection. But the difficulties of concept, definition and measurement seem immense: for example in this paper I have ignored entirely how one might give quantitative expression to the social demand function and manpower demand function. I have discussed some of the difficulties, enough I hope to indicate that an early solution to the problem seems remote.

METHODS OF FORECASTING ENROLMENT IN HIGHER EDUCATION IN FRANCE

by

Miss C. DUTILH

For some years now higher education in France, as in other countries, has been going through a period of far-reaching change, both quantitatively and qualitatively. Quantitatively, higher education, formerly the preserve of a small élite, is now opening its doors to an ever increasing number of students. Qualitatively, the old structures are being adapted and varied as a result of this increase in students and in their requirements, the demands of science, the development of occupations, and the country's need for senior scientific, technical, economic and administrative staff.

These changes mean that forecasting is essential if development is to be properly oriented, but they also make it extremely difficult. It is not possible to make forecasts merely by extrapolating past trends and data.

Forecasts have been undertaken in France during the past ten years or so, mainly in connection with the preparation of plans outlining physical capital requirements. They are brought up to date each year.

The First Plan covered only six economic sectors, which were regarded as essential and of top priority, and thus took no account of equipment needs in "social" spheres. Education was included in the Second Plan, but allocations were made on the basis of an empirical assessment of requirements. For the Third Plan (1958-61) a systematic forecast of the trend of school and university enrolments was undertaken and was continued and developed in the preparation of the Fourth (1962-65) and Fifth (1966-70) Plans.

The School and University Equipment Committee, which is responsible for the educational sector of the Plan, includes an "Enrolments Sub-Committee", which submits to the plenary Committee forecasts of enrolments in the various levels of education, based on studies carried out by its rapporteurs in conjunction with the appropriate services of the Ministry of Education - Central Service of the Plan, Central Statistical Service, and, for higher education, the Directorate for Higher Education. (The last-named, which includes a Forecasting Office, is closely associated with the work, since forecasting requires an intimate knowledge of the structure and orientation of higher education and of any problem which arises (1). Moreover, there has been an increasing tendency to associate the regional bodies of the Department of Education, and, through the Rectors, the University (2).

The three main series of forecasts corresponding to the three plans covered the following time spans: IIIrd Plan - 1956-57 to 1965-66; IVth Plan - 1960-61 to 1969-70; Vth Plan - 1965-66 to 1972-73.

Limits. - The forecasts relate to enrolments in universities and attached institutions, and to institutions which are not attached to the universities but are under the control of the Ministry of Education, so that they do not cover private institutions or institutions controlled by other Ministries. However, some of these students are also enrolled in a University and those who are not are very few in comparison with the total enrolment in higher education; their number increases less rapidly than this total, and will thus become proportionately less important. Lastly, these establishments offer a limited number of places and their intake does not vary with demand. Nevertheless, it is desirable that in the future, forecasting be extended to cover all forms of higher education (3) whatever the status of the institutions providing it or the Ministry responsible for them.

+

+ +

---

(1) The Services mentioned above are those co-operating at present (and which were concerned in the preparation of the Vth Plan), but the Central Service of the Plan was not established until 1964. On the other hand, for the IIIrd and IVth Plans a very important contribution was made by B.U.S. (University Statistical Office), a public body attached to the Ministry of Education. Other private and public bodies made enrolment forecasts though limited to a special branch of study (e.g. medicine) or a particular region (e.g. the Paris region).

(2) Forecasts relating to their "academies (the regional, educational administrative unit in France) were requested in connection with the three Plans, but for the last their participation was specially organised and developed (cf. Part II, (4)).

(3) During the preparation of the IVth Plan the desirable number of enrolments was assessed for all Engineering Schools, both public and private.

The following will now be examined in turn:

I - Main factors of a general nature to be taken into consideration in forecasting enrolments;

II - Forecasting methods used hitherto;

III - Results and proposed improvements.

I. FACTORS IN FORECASTING

These factors will be considered with reference to total enrolment (and not to a geographical breakdown or one by field of study, any special aspects of which will be discussed later when describing methods). They may be grouped under two headings: access to higher education; and length of course. We shall also consider the possible influence of forecasts of the structure for the active population on enrolment forecasts.

1) Access to higher education

a) Statutory conditions of admission

Access to those faculties in which the majority of the students are enrolled is open without restriction to holders of the Baccalauréat (in future, however, access to the Faculty of Science will be limited, with a few exceptions, to holders of the scientific or technical Baccalauréats, though anyone meeting this requirement will be able to enrol). Only in the Engineering Schools and certain specialised Schools and Institutes is admission subject to a special competitive or entrance examination. In general then, the number of enrolments in higher education is a function of the number of students obtaining the Baccalauréat and their propensity for further study; students who fail to gain admission to Schools with a restricted intake enrol in the Faculties.

Apart from the Baccalauréat, admission to the Faculties may be obtained by means of a special entrance examination or by holders of certain technical diplomas, but the number of students entering in this way has so far been very small. The creation of a short higher technological course (University Technological Institutes) will probaby lead to an increase in the admission of holders of the "Brevet de Technicien" (but it is planned to reform these certificates and convert them into a "Baccalauréat de Technicien"). In the Law Faculties there is a two-year preparatory course specially designed for students not holding the Baccalauréat (the so-called "capacity" course in which students passing with a specified grade can then register for the first year of a law degree).

b) Demographic situation

The demographic situation is characterised by the sudden rise in the birth rate which started in 1946, and has continued since. This "demographic wave" which has swept through primary and secondary education has now reached higher education. The 18 year-old age-cohort numbered 614,000 persons in 1963; 815,000 in 1964; 851,000 in 1965; and is estimated at 815-825,000 in 1972.

The population increase itself is relatively easy to assess, (although certain events may suddenly throw the forecasts out, as for instance the large-scale return from Algeria in 1962), but its effects are not directly foreseeable beyond compulsory education. One might even imagine an extreme situation where the enrolment rate fell in proportion to the population increase, so that the incidence of the latter was fully compensated.

In fact, the inverse phenomenon has occurred: the effect of the population factor has been magnified by the growth in the enrolment rate.

c) Enrolment rates in secondary education

Long before the "demographic wave" reached the schools, and even when the smaller wartime cohorts were at the appropriate age, secondary enrolments had increased considerably due to a rise in enrolment rates. (The enrolment rate in terminal classes was 8,1 % in 1954, 18.1 % in 1962) This increase was the result of economic, social and psychological trends, and is reflected in the number of students obtaining the Baccalauréat (1951: 33,500; 1961: 61,500) and who, as we have seen, form the main source of supply for higher education.

Forecasts must necessarily take account of this phenomenon and of the forecasts for secondary education made elsewhere.

d) Propensity for higher education

Up to now, the demand from Baccalauréat holders for higher education has been very high. We must consider whether it will remain so despite the increase in numbers; in other words, we must assess the interplay of economic, social, psychological, and structural factors at the level of higher education (an adaptation of the education offered, assistance to students,etc).

Where other means of access exist, the problem arises of assessing the size of the intake through these channels (cf.(a) in fine).

2) Length of time spent in higher education

While total enrolment obviously depends on the number of students entering higher education, the length of time the student stays in the university is also important.

The time depends primarily on the structure of the curriculum and the statutory duration of the various forms of training. This influence may be very difficult to assess; for instance, the introduction of shorter courses may lead to a smaller relative increase in enrolments, since the students taking these courses will not stay so long, but on the other hand students who would not have been tempted by a longer course may be attracted into higher education and thus increase the size of the intake.

His length of stay will also depend on the tendency of the student to continue after obtaining a first degree, for instance to go on to post-graduate work to become highly specialised or to prepare a Doctor's degree.

But the prescribed duration of courses leading to the various degrees and diplomas as defined in the regulations is not the only factor to consider; just as important is the real duration - the time students actually take to get their degrees, taking into consideration examination failure, repeats, drop-outs, etc., in short, whether his work is more or less "productive".

This factor was important in the French system where unrestricted access to the Faculties for Baccalauréat holders and, until the recent reform of arts and science courses, some inadaptation to courses and working conditions to the new situation produced by the rapid rise in enrolments was accompanied by a high rate of examination failure and of repeat years during the first part of the course; moreover, the high degree of freedom in the enrolment system, whereby students could register without being obliged to sit the end-of-session examinations, was conducive to a longer period in the university than normal (1).

The forecasts for the Vth Plan ran up against special difficulties concerning the period spent in higher education. The reorganisation and diversification of the structure of science and arts studies (affecting approximately 2/3 of all University students) and the creation of a new type of establishment providing a short two-year course (University Technological Institutes), made both the division of the students among these new courses of varying duration and the students' "output" very uncertain, since these could not be estimated from past data.

---

(1) The reform of arts and science courses put an end to this tolerance for the first two years of the courses; it is also being abolished for the first two years of the Law and Economic courses.

3) Enrolment and active population forecasts

We do not have to consider here how far the expansion of higher education should or could be oriented in line with the requirements of the national economy. But whatever the attitude adopted, those responsible for educational policy cannot disregard the problem of harmonising the main directions taken by higher education with the changes in the structure of the active population.

For this reason, when preparing the IVth Plan, the School and University Capital Equipment Committee asked the Manpower Committee to carry out a study of the active population trends broken down by economic sector and educational attainment (six educational levels were defined, of which the first three concern higher education). The Manpower Committee was unable to communicate the results of this study until after the enrolment forecasts had been completed, but these results confirmed the considerable need for graduates of higher education. For the Vth Plan the Manpower Committee improved the study undertaken for the IVth Plan and gave an order of magnitude for foreseeable requirements and outlets at this level.

At the same time as a forecast based on the spontaneous demand for higher education and which, under the present system of unrestricted access resulted in what might seem fairly high figures, a forecast was made based on what is considered a desirable demand in view of these indications (and possibly on the basis of secondary school enrolment). The results of both forecasts are close, and in comparison with the demand for graduates, the supply will still be inadequate.

In fact, the problem is not at present one of total numbers enrolling, but rather of chanelling students into certain fields of study, and in this matter, the School Equipment Committee, for both the IVth and Vth Plans, fixed objectives which would slant assessments in the direction of presumed employment outlets. The "forecasts" thus acquire a "directive" character.

Forecasts of the structure of the active population are still at the experimental stage however, and should be given only very general consideration, as indicating a tendency or an order of magnitude.

II. FORECASTING METHODS USED

Forecasting methods are based on an analysis of the factors briefly outlined above and imply the satisfactory measurement of these factors and their influence. One of the difficulties encountered is the inadequacy of statistical data on the educational process.

Admittedly some progress has gradually been made in stock statistics, which are compiled by means of annual surveys carried out by the Ministry of Education.

But these surveys do not yet contain sufficient detail, especially as regards ancillary data (age, social origin, etc.) and, in addition, so far, for various reasons, there has been no co-ordination between the statistics for university and non-university institutions.

Above all, these are only global statistics relating to stocks, and the flows have to be deduced from examination results and the comparison of year-by-year stocks; the results of these calculations are approximate and the breakdown inadequate (e.g. if we know the percentage of repeaters in an academic year, we do not know how many are repeating for the first, second, or even more time, or how many have dropped out; again, although we get a general idea of "productivity" by comparing the number of graduates in a given year with the number of first-year students so many years previously, we cannot deduce how many of these first-year students took their degree in the prescribed period, how many took longer, or how many never took it at all. The analysis is even more complicated in the 2nd cycle of arts and science studies where courses are not organised in years, but according to the certificate system - the student must obtain a certain number of certificates, but can take any number he pleases each year.)

Lastly, very few correlations could be established either between the internal elements of the educational system or with external elements.

Special surveys on particular points, or sample surveys, had to be used to provide more precise additional data.

A system designed to correct this situation has just been introduced and will be discussed in Part III. In the past, however, account has had to be taken of the fact that the data were static and insufficiently analytical methods used which may seem rather rudimentary.

Since the IVth Plan, forecasts have covered: total enrolment for French students, enrolments of foreign students, breakdown of students by main field of study and by type of establishment, and their geographical distribution (for the IIIrd Plan only the first and third items were covered). These various aspects will now be considered in turn.

As already indicated, only enrolments in establishments attached to the Ministry of Education are estimated. These establishments include: various University Faculties and Institutes, Engineering Schools, and,-in addition - for the Vth Plan - University Technological Institutes. The IIIrd Plan prepared forecasts for the Faculties only, which at that time represented practically the total number of enrolments. The IVth Plan extended the forecasts to the Universities as a whole (Faculties, Institutes and Engineering Schools attached to universities), but for statistical reasons estimates were essentially based on Faculty enrolments, which were by far the most important; for Engineering Schools not attached to universities, enrolments were calculated for each School and added to the rest. Forecasts for the Vth Plan covered all establishments from the outset.

1) Total enrolments of French students

Two types of method were used. One was based on an analysis of school careers through secondary and higher education, and the other on the analysis of enrolment rates in relation to age groups. Each method may be more or less analytical, and each may be used at national level or region by region ("Academies"), total enrolments being the sum of enrolments in each region.

The first method was used in different forms for all three Plans. The second was used for the IVth Plan, but only for the geographical breakdown of enrolments and not for their global forecast, although it was used for this purpose in the Vth Plan, along with the first method.

An effort is made to try at least two methods in order to compare results.

A. Method based on educational flow

This method consists in estimating the flow of students into higher education and, from this, forecasting student enrolments on the basis of their school career. In view of the importance of the Baccalauréat in determining the intake, the method has so far been applied as follows: French student enrolments are determined on the basis of the number of pupils obtaining the Baccalauréat, who are in turn assessed on the basis of the numbers entering the first year of secondary school ("classe de 6e") (1). Adjustments can be made to take account of means of access other than the Baccalauréat.

An advantage of this method was that, as first-year pupils in year n take their Baccalauréat in year n+7, it was possible to forecast Baccalauréat holders for seven years on the basis of known (first year) enrolments. But this advantage will gradually disappear as first year enrolment in secondary education becomes universal and the main selection and orientation of pupils shifts to the end of the 4th year, i.e. only three years before the Baccalauréat.

In its analytical form this method was adopted for the IIIrd Plan and developed in the IVth Plan; in its global form it was used in the IVth and Vth Plans.

a) Analytical form

The method, as used in the IVth Plan, was as follows: On the basis of the percentage of pupils moving up from one grade to the next each year, the enrolment figures for each cohort who entered the first year of secondary education was calculated from the first to the 7th year, the number who obtained the Baccalauréat being calculated on the basis of the normal proportion of passes.

Once the total number passing the Baccalauréat is obtained, it is broken down by type of Baccalauréat. On the basis of the ratio of first-time Faculty registrations to the year's Baccalauréat passes and the breakdown by type of Baccalauréat, the number of new entrants (2) in the first year of the various Faculties is assessed, total first-year enrolment then being calculated according to the ratio of these new entrants to total first year enrolments. For each group of faculties, first-year enrolments are used to assess enrolments for each of the following years and types of courses, and the total of [illegible]) all the years equals global enrolments (1).

---

(1) In secondary education there are seven years leading to the Baccalauréat ("6e, 5e, 4e, 3e, 2e, lère, terminale").

(2) It was considered that the number of students entering by new means of access other than the Baccalauréat would be marginal, and that any resulting error would be included in the overall margin of uncertainty. But the method could quite well take them into account if necessary and need not be restricted to Baccalauréat holders in order to assess intake. As regards the preparatory course for law referred to above, enrolments, which were relatively high, were assessed on the basis of those for the first year of the law degree.

The breakdown of Baccalauréat holders by type of Baccalauréat was obtained by extrapolating the data for the past ten years, on the assumption that observed tendencies would be maintained, with a slight weakening; we shall see later that the real trend was different. The number in each type of baccalauréat was then broken down by group of Faculty on the basis of the average distribution for the previous three years, (data for earlier years were not known, but it could be assumed that distribution was at that time fairly stable). Lastly, as regards students' career in the higher education, the proportion of students moving up each year was calculated on the basis of the trend,observed during the previous ten years and of the expected effects of certain reforms (reduction of one year in medicine, changes in the science degree, introduction of a short science course), an expected improvement in the efficiency of the system (better teacher/student ratio, etc.), and the development of post-graduate studies, etc.

This analytical method presupposes the existence of a large volume of detailed basic data on the efficiency of the system and although it was applied with the available stock statistics on the basis of the relation between successive years' stocks, it requires flow statistics in order to meet its full potential.

Moreover, as the method implies not only deciding on some major coefficients, such as the proportion of Baccalauréat holders going into higher education, but also estimating the trend for a variety of coefficients relating to students' productiveness, it presents particular difficulties when a new structure is introduced during the period covered by the forecasts or when the assumptions on which this productiveness is based have no foundation in the past.

This problem arose to some extent with the IVth Plan following the reforms in medicine and science, but their effects on enrolments were not basic; on the other hand, in view of the scope of the arts and science reforms referred to above, it was not possible to use this as the main method for the Vth Plan.

However, it was used as an ancillary method a posteriori, to obtain a student breakdown by level of study and to make a first estimate concerning the number of graduates and requirements of teaching staff. For arts and science several estimates were made based on different assumptions concerning the students' careers and rates of promotion from one year to another in the future system. The estimate finally accepted was the one which agreed most closely with total enrolments as forecast according to the two methods selected.

---

(1) This method was applied at the time to students' careers only in the Faculties, but it could also be applied to other types of establishments.

b) Aggregate form

This more rudimentary method does not require the use of so many coefficients and, for the reason indicated above, was adopted for the Vth Plan.

The method is based upon the fact that two significant relationships were observed one between Baccalauréat holders and enrolment in the first year of secondary education seven years previously, and one between the number of students in higher education in a given year and the number of Baccalauréat passes in preceding years.

It was adopted for the IVth Plan together with the analytical form and was based on two ratios:

$$\frac{\text{Baccalauréat holders in year n}}{\text{first year secondary pupils in year n-7}} \text{ and } \frac{\text{French students in year n}}{\text{Baccalauréat holders in year n-1}}$$

A refinement was introduced for the Vth Plan.

On the one hand, the relationship between Baccalauréat holders and first year secondary pupils was broken down into two ratios, introducing a new coefficient at 5th year level "classe de 2e"):

$$\frac{\text{Baccalauréat holders in year n}}{\text{5th year secondary pupils in year n-3}} \text{ and } \frac{\text{5th year secondary pupils in year n}}{\text{first year secondary pupils in year n-4}}$$

As indicated earlier, enrolment in first year secondary school is gradually becoming general and a critical stage in orientation now occurs at the end of the 4th year; the breakdown allows us to assess its results better.

On the other hand, the ratio between total student enrolments and the number of Baccalauréat passes in the previous year gives a much too immediate reflection of year-to-year variations in the Baccalauréat, i.e. in new entrants, whereas enrolments also depend on the number of entrants in previous years still pursuing their studies. For the IVth Plan a corrective factor was introduced to reduce this disadvantage, but it seemed preferable to substitute a ratio between the number of students in a given year and the sum of Baccalauréat holders in the previous four years:

$$\frac{\text{French students in year } n}{\text{Baccalauréat holders in year } n-1+n-2+n-3+n-4}$$

The coefficients selected were evaluated for the previous ten years and the problem was then to trace their trend.

We shall not discuss estimates of Baccalauréat passes in detail here, as they relate to secondary education. The only reason these estimates had to be made for higher education forecasting, was that existing secondary forecasts related only to France as a whole, whereas higher forecasts had to be broken down for each region ("Académie").

The ratio students/Baccalauréat holders has increased steadily over the past four years, and to assess its future magnitude the relative importance of the various factors involved had to be considered:

- Variation in the admission rate of Baccalauréat holders into higher education. The entry rate is very high at present and can hardly increase even further. On the other hand, it does not seem that the increase in the number of Baccalauréat holders should lead to a fall in the admission rate; economic, sociological and psychological factors induce students to go on to higher education and the establishment of U.T.I. will allow young people who do not wish to engage in lengthy studies to take a two-year course;

- The extent to which young people without the Baccalauréat are admitted to higher education. The establishment of U.T.I.s will probably make the admission of holders of the "Brevet de Technicien" easier.

- Duration of studies: prescribed duration and actual duration. As regards this last point, there was a possibility that the reforms introduced might bring about such far-reaching changes that the relevant ratios might cease to have anything in common with those observed in the past and hence could not be estimated on the basis of past observations. This did not appear to be the case and the following factors were considered when making the estimates: to some extent, a shortening of the duration of studies owing to the establishment of the U.T.I.; the reorganisation of arts and science courses, and higher output of graduates in these subjects (due to greater relevancy of subject matter and also to stricter organisation), but on the other hand, a lengthening of studies due to the increase in post-graduate work in all Faculties, introduction - in the first two years - of a part-time system spread over a longer period than the full-time system, etc.

- A purely statistical reason also led to certain adjustments: the fact that up to 1960 data related only to Faculty enrolments, whereas forecasts had to cover enrolments in all Ministry of Education establishments, Faculties and Institutes, university and non-university establishments, the latter being comparatively unimportant.

Finally, taking into account all factors operating in one direction or another, the ratio of students to baccalauréat holders is expected to be the same in 1972 as it was in 1965.

Another method was also used at the same time, and had there been any substantial disparity between the results of the two methods, the selected coefficients would have been reviewed.

B. Methods based on enrolment ratios

This method has so far been used only very partially for higher education forecasts, and will be discussed very briefly.

Enrolments are estimated by applying the enrolment rates in the various levels of education to the corresponding age groups. This method is very easy to handle for enrolment forecasts in compulsory education, but is much trickier at other levels, particularly that of higher education where the year of study does not correspond so closely to age, and enrolments may cover many different age groups. Only very general data were available (and were also incomplete, covering Faculties only). Here, too, extrapolation had to take account of many operative factors. Even if the method is relatively less dependent on educational structures than the previous one, enrolment rates are nevertheless linked to such structures and, for the Vth Plan, the problem of evaluating the effects of the reforms also arose.

Accordingly, in the Vth Plan as in the IVth, the method was used mainly at the level of the final year of secondary school and admission to higher education; total enrolments were then assessed on the basis of the admission flow and school career.

For the IVth Plan, it was not intended to estimate total enrolments by using this method, but rather to break down the global figure obtained with the previous method into enrolments by region (academies), on the basis of enrolment rates in the final year of secondary education in the various regions (academies).

For the Vth Plan, on the other hand, an attempt was made to use this method to compare the results with those obtained by the other one.

However, we were not trying to arrive at an estimate of the trend for enrolment rates, but, as indicated in Part I, at an estimate on the basis of objectives regarded as economically and socially desirable (while remaining within the bounds of feasibility considering the trend in secondary enrolment).

This estimate used the target established for enrolment in the final year of secondary education; a rate for admission to higher education was fixed and applied to enrolments in the terminal classes, as defined above and thus the number of admissions to higher education was determined, and multiplied by an average duration of studies assessed in the light of the reform.

The method was therefore used in a very summary manner in higher education (1) (on the other hand it was used much more extensively for forecasts at other levels) and merely as a general approach in order to obtain an order of magnitude of the situation which would be desirable at the end of the Plan. Its various possibilities will now be studied more closely.

For the IVth and Vth Plans, as has been seen, two approaches were used so that results could be compared with each other (and also with the forecasts prepared by the Rectors, administrative heads of an Académie); for the IVth Plan, both the analytical and the global forms of the educational career method, and for the Vth Plan, the global form of the latter and the enrolment ratio method.

For the IVth Plan, the analytical method was used for enrolments in the whole of France, and the global method applied for each region. The results were added together. The numbers obtained were very similar for the final year (1969-70), but were reached by a different route. For the Vth Plan, both methods were applied region by region using coefficients adopted for France as a whole though local conditions were taken into account; here, too, results for the final year of the forecast were similar to each other (1972-73) (1). Admittedly, this is no guarantee of absolute accuracy since, as shown in Part III, the IVth Plan enrolment forecasts were in fact exceeded, but the probability of accuracy is no doubt greater, if the two methods used are basically different, than if two variants of the same method are employed - hence the importance of diversifying the methods used.

---

(1) It should be noted however, that the National Institute of Statistic and Economic Studies made an extrapolation of enrolment rates, by age group, for all levels of education combined, i.e. including higher education, based on the trend observable in the two most recent censuses (1954 and 1962).

2) Foreign student enrolments

Foreign students are too numerous to be ignored (8.5 % of the number of French students in 1965) and must be taken into account in the forecasts which will be used as a basis for planning investment outlay and staff requirements (2). But such enrolments do not depend on easily foreseeable factors; they are affected by the international situation, the state of relations between the host country and other foreign countries, the measures taken by developing countries to increase local training facilities, etc.

The proportion of foreign to French students increased from 1950 to 1958; the IVth Plan stabilised it at the 1958 level (10 %), on the assumption that foreign student enrolment would not increase more quickly than that of the French, but would stay about the same. However, in view of the expected massive increase in French enrolments and the trend in foreign enrolments from 1960 to 1965, it was not thought that this parallel increase would be maintained and the proportion of foreign students was reduced to 6.5 % or 49,000 in 1973 (IVth Plan: 50,000 in 1970). Some members of the Committee thought this an underestimate, but the Committee in general considered that if the influx of foreign students was larger than expected, it would probably be offset by an increase in the number of French students going abroad for specialised training.

---

(1) For the IVth Plan, enrolments for all intermediate years were calculated by means of the two methods used; for the Vth Plan, they were calculated with only one of them (educational career); but as the enrolment fluctuations caused by any educational reform in the first few years of its implementation are difficult to foresee, particularly as at the time it was not known whether students who had started under the old system would finish under that system or under the new one, the Plan took no account of estimates for the intermediate years, except 1967-68.

(2) Only those enrolling for a course of at least one year's duration are taken into account, and not those following special courses of a few weeks or months.

3) Breakdown of enrolments by major field of study and type of institution

(The "major fields of study" are law and economics, arts and humanities, science and technology, medicine, pharmacy).

The analytical method based on educational career by type of institution automatically gives the breakdown of students by major discipline and type of institution. Otherwise the breakdown has to be made a posteriori on the basis of global enrolments: a breakdown by field of study is made first and then enrolments by field of study are allocated among the various types of institutions mentioned above - Faculties and University Institutes, Engineering Schools, and (for the Vth Plan) University Technological Institutes.

Here, to some extent, estimates are channelled according to the objectives considered generally desirable (see Part I - (3)), but an effort is being made to keep them within the realm of feasibility.

Breakdown by field of study

(This breakdown may be made separately for French and foreign students - the pattern of their choice of field of study being different, or for enrolments as a whole).

The Committee of the IVth Plan accepted the assumption that the trend observed since 1945 towards an increase in the proportion of science Baccalauréat holders and science students would continue (although with some slowing-down). Although this assumption was soundly based on the continuation of the trend for the previous years (1), it implied there was no limit, in the organisation of secondary education, to the proportion of pupils able to choose science studies. The "directive" attitude came into play here, for although the Committee was aware that such a limit did exist, it nevertheless accepted the assumption, as it fell in with the objectives considered desirable in the light of the presumed changes in the active population; but the Committee's report stated: "such an assumption obviously implies the availability of ideal pedagogical conditions (curricula, methods, teacher-student ratio, etc.) for the expansion of the various science sections in the lycées."

---

(1) We have seen that in the analytical method of the educational career used for the IVth Plan, the breakdown of Baccalauréat holders by type of Baccalauréat was extrapolated from the previous ten years' data on the assumption that the tendencies observed would continue with a slight weakening. This resulted in the maintenance of the rise in the proportion of science Baccalauréat holders and consequently of Science Faculty enrolments. The proportion of science students thus determined was marked up slightly by the Committee.

Actual demand was not in line with that estimated, and in 1960 there was a break in the relative increase in science Baccalauréat holders and science students (see Part III).

In view of the establishment of University Technological Institutes and of various considerations operating at the secondary level, the Vth Plan assumed that the relative stagnation in science enrolments would not continue; however, if the target fixed in this field was less ambitious than in the IVth in order to take account of the existing situation, it nevertheless remains a "desirable" objective.

It would be particularly useful to be able to analyse and keep track of the subject choice of secondary pupils in order to improve forecasts of the orientation of Baccalauréat holders (e.g. to foresee changes in trend such as that which occurred in 1960) and to be able to limit targets to what is actually feasible - for, in any case, even if the necessary measures are taken, their effects are not immediate.

Breakdown by category of establishment

(It has already been remarked that the forecasts made for the IIIrd Plan covered the Faculties only; the problem of breakdown of enrolments by type of establishment did not therefore arise.)

As access to Engineering Schools is restricted, enrolments do not depend on demand but on the number of places offered. This number is assessed for each School on the basis of the economy's estimated requirements, and the growth potential of each establishment.

Enrolments in Engineering Schools are subtracted from total science enrolments (1).

The first University Technological Institutes are to open in the autumn of 1966; as these are an entirely new type of establishment, enrolments have been estimated in an aggregate and somewhat arbitrary manner (25 % of enrolments in science, law and economic sciences, arts and humanities) in terms of estimated graduate requirements at this level. But this is provisional and will be reviewed according to the rate at which establishments come into operation and the actual numbers enrolled, etc. These provisional enrolments were also subtracted from total enrolments.

---

(1) In the IVth Plan where total enrolments were calculated for the universities only, enrolments in non-university Engineering Schools were simply added to global enrolments. However, there might be an objection to subtracting University Engineering School enrolments from total enrolments, as the latter related to Faculties only rather than to Universities (the analytical method of educational flow being based on the intake of Baccalauréat holders and the length of time they remained in the Faculty, and the global method using Faculty statistics only). This question will be further discussed in Part III.

The remainder is the number of enrolments in Faculties and University Institutes (other than Engineering Schools and U.T.I.)

4) Geographical breakdown

A final series of forecasts required relates to the breakdown of student enrolments by region (academies). For the Vth Plan the following procedure was adopted.

The methods described above for forecasts of total French enrolment were applied for each region (academy) (1).

Of course the coefficients used were not identical with those used at national level, which are average coefficients for the whole country. Account was taken of the specific situation of each region, and in particular whether secondary enrolment was above or below average. As already indicated, this work was carried out in close collaboration with the responsible local officials (2).

---

(1) The academy is the regional administrative district of the Ministry of Education and usually includes a university in its bounds. However, three of the seven new academies created since 1962 have not yet a university (they contain higher educational establishments, but a university is constituted only when there are at least two Faculties, which is not yet the case in these academies).

(2) Instructions had been given indicating the methods to be followed and a series of essential basic numerical data had been supplied. Each study was reviewed in the context of the national forecast; any modifications which seemed necessary were suggested to the Rectors at working meetings, academy by academy, and only thereafter was a definitive figure adopted.

Estimating enrolments at the regional level is especially difficult owing to student migration from one university to another. A distinction must be made between students "originating" in an academic district (whose parents reside there and who have accordingly completed secondary education there) and students who are actually "enrolled" in the district's higher educational establishments (regardless of the district in which they were originally enrolled). Certain academies have a high volume of immigration and the number of students enrolled is much higher than the number of students originating there; in other academies emigration is higher than immigration.

The use of the methods proposed makes it possible to obtain the number of students originating in each academy. From this, we have to calculate the number of students actually enrolled, giving due consideration in each case to the weight of migration factors - existence of schools recruiting at national level, particular specialisations, or, on the contrary, absence of certain forms of education, etc.

It was along these lines that the problem of the University of Paris was tackled; it seemed inevitable - and normal - that immigration should continue to be high. Its relative value was reduced however in view of: the expansion of the provincial universities, the academies recently established in the outer suburbs, and the regulation providing that students not originating in the Paris academic region would be accepted only for courses not existing elsewhere. This assumption corresponds to the trend in the past ten years and to the development desirable in the future.

It was estimated that the number of students "enrolled" in the seven new academies established since 1962 would increase substantially (subject to the increase in available courses and equipment) while remaining below the numbers originating there.

Naturally, for the country as a whole the total number of students "enrolled" must be the same as that for total number of students "originating", as they are the same students and it is merely a question of geographical distribution.

Lastly, once we have determined the number of French students enrolled in each academy, we add the number of foreign students, keeping in mind the degree of attraction which the academy at present has for foreign students and which it is likely to have in future.

III. RESULTS AND IMPROVEMENTS ENVISAGED

It has been shown that structural changes have caused a considerable degree of uncertainty in the most recent forecasts and have made it necessary to make an overall approach. But, apart from this special problem, improvements could in any case be made. before considering them briefly, we shall compare the forecast with the actual enrolments.

Unfortunately, this comparison can be made only for the forecasts relating to the IIIrd and IVth Plans, since the first year of the Vth Plan forecasts is 1967-68.

As regards the 4th Plan, we must return first of all to a purely statistical disparity, to which we have already referred, concerning enrolment in University Engineering Schools. Up to 1960-61, surveys of university enrolments covered Faculty students only and not those of attached Institutes. After that date Institutes were also covered and added to Faculty enrolments. But earlier forecasts were thus based on incomplete data, resulting in an underestimate of marginal but real importance, since Institute students not enrolled in the Faculties numbered 20,000 in 1964-65. Moreover, their breakdown by major field of study is different from that of Faculty students, since many of them are to be found in the humanities, increasing that discipline's proportion of the total.

The comparison will therefore relate to the number of French students enrolled in the Faculties, and not to total enrolments (and which, incidentally, makes it possible to include the IIIrd Plan forecasts covering Faculties only). Percentages are shown in the following table.

	Difference between actual and forecast enrolments (as a percentage)	
	IIIrd Plan	IVth Plan
1956-57	- 1.6	-
1957-58	- 2.3	-
1958-59	- 4.7	-
1959-60	- 7.3	-
1960-61	- 10.8	- 2.6
1961-62	- 6.4	0
1962-63	- 1.1	+ 5.9
1963-64	+ 6.7	+10.9
1964-65	+ 10.2	+10.5

As no details of the analyses made for the IIIrd Plan were available, I could not examine the causes of disparities. For the IVth Plan, the fact that, up to now, actual enrolments are higher than those forecast is not due to an underestimate of new Faculty enrolments, but to an underestimate of total enrolments in relation to new entrants, owing largely to a poorer performance on the part of the students than had been expected. For instance, in the estimates reached by means of the analytical method, the total number (1) enrolled in the 1st year preparatory course in relation to those taking the course for the first time were 125.7 % in arts and 140.8 % in science in 1964-65, whereas the actual figures for that year were 139.7 % and 151.9 % respectively - indicating a higher percentage of repeaters than expected; similarly, the number of first degree students in post-preparatory year classes, in relation to the number of enrolments in the preparatory course during the preceding years, is higher than expected.

For the breakdown by field of study, which is particularly difficult to forecast, we have already indicated that the relative increase in Science Faculty enrolments was not maintained, for various reasons, including the stabilisation of the proportion of Science Baccalauréat holders after 1960 (particularly since Faculties other than Science now attract more holders of the mathematics Baccalauréat than in the past (e.g. Faculty of Law and Economics for the degree in economics, and the Faculty of Medicine).

We shall not go into a written description of the trend in other disciplines. The following table gives the forecast and actual student breakdowns in 1964-65 (as a percentage).

STUDENT BREAKDOWN BY FIELD OF STUDY IN 1964-65

(in percentages)

Major Fields of Study	French Faculty students			French and foreign university students combined (Faculties, Institutes)	
	IIIrd Plan	IVth Plan	Actual	IVth Plan	Vth Plan
Law	21.4	15.6	17.5	16.4	20.2
Arts	23.5	26.4	33.1	27.0	33.4
Science	32.3	40.2	33.2	38.3	30.8
Medicine + Pharmacy	22.8	17.8	16.2	18.3	15.6

---

(1) First-time enrolments plus repeaters.

As indicated in Part II - 3, it would be helpful to know more about the subjects taken by secondary pupils and to compare them with the field of study subsequently chosen.

Improvements envisaged

Some revision is inevitable owing to structural and organisational changes which occur after the forecasts have been prepared and which could not be anticipated at the time of preparation (1), or owing to structural changes planned at the time but whose effects are difficult to assess, as has been seen, or to the importance of human behaviour in such a field as education. Nevertheless we can try to reduce the margin of uncertainty by improving basic data and methods.

We are in the process of replacing the static system of stock statistics by a system of individualised data enabling us to follow student flows and establish numerous correlations.

On the basis of experiments in recent years, a computer-processed/student index (2) will be introduced in two stages: in the autumn of 1966 for all Arts and Science Faculties and in the autumn of 1967 for all establishments. The information relating to each student (civil status, sociological and socio-professional information, previous education) will be stored in the computer memory and brought up to date each year. An accurate knowledge and an analysis is then possible of access to higher education (as the records will include particulars of the Baccalauréat or other certificate of admission), educational career in all its composants and in relation to the main factors which influence it, whether inside or outside the educational system. It is particularly fortunate that this new system has been introduced at the same time as the new organisation of science and arts courses.

We have seen that what occurs at secondary level considerably influences enrolments in higher education, both concerning total numbers enrolled and the breakdown by field of study or geographical distribution. Here, too, available data is to be made more precise. Although there was better co-ordination in the preparation of secondary and higher education forecasts, this still left something to be desired in the preparation of the Vth Plan, but should now be facilitated by the existence of a Central Statistical Service, and a Central Service of the Plan in the Ministry of Education.

---

(1) And not only changes in higher education itself; for instance, the introduction of an additional, exceptional sitting for the Baccalauréat in 1960 led to a higher percentage of passes and therefore of admissions in higher education that year.

(2) As the universities are equipped with computers in the first stage, they will be responsible for processing for themselves and associated institutions, according to a nationally laid down tabulation scheme and the results will be centralised. In the second stage it is planned to process at the national level with duplicate records, the universities continuing to hold one copy and process according to their own requirements.

Lastly, as regards the comparison between trends in the educational system and in active population structures, analyses are being continued and developed in a study group consisting of the Manpower Committee (study group on "Training and Adult Vocational Training" in the Commissariat of the Plan).

With such fuller and more detailed data, forecasting methods will be made less empirical and more scientific. Significant correlations can be looked for within the educational process and with outside factors. On this basis it is proposed, in accordance with a recommendation of the Plan Committee, to establish an actual model of the educational system the use of which will make it possible to examine the implications of the variation of any particular factor (and particularly the implications of the decisions envisaged), or to compare the results of several assumptions, etc.

In addition, it is necessary to extend the period covered by the forecasts in view of the time-lag, particularly in higher education, between the time when a decision is taken and when its full effects are felt.

At the same time as an affort is being made to secure greater precision, forecasts will be compared with actual developments and brought up to date. The Vth Plan Committee, realising that the forecasts are only approximate, has requested, as for the IVth Plan, that they should be "constantly reviewed".

CRITICAL SURVEY OF THE FORECASTING METHODS IN BELGIAN UNIVERSITY POPULATION FORECASTS

by

E. MEULEPAS

In his article "Forecast of the University Student Population until 1970" K. Mertens expressed the need for a broad confrontation between the various forecasting techniques used in Belgium.

In this contribution we will have a closer look at these forecasting techniques. We shall discuss first the methods used, next we shall indicate the pre-supposed hypotheses, and finally we shall assess the value of the results.

The statistical methodological part includes some tips to lighten the computational burden, the straightening out of a common misconception about the meaning of confidence intervals, the indication of an identity between some commonly used tests of significance, and a new - as far as we know - though mathematically rather loose derivation of the expression for a regression coefficient in simple regression.

The correctness of forecasts is determined in the first place by a degree of fulfillment of the hypotheses. Since in none of the forecasts the hypotheses were formulated explicitly in plain words, we shall try to fill this gap. To a lesser extent the quality of forecasts is determined by the statistical techniques used. The method of least-squares was applied by some apprentice magicians in a not so lucky way.

I. STATISTICAL METHODS

A. THE COMPUTATIONAL TECHNIQUE OF LEAST-SQUARES

1. To make a forecast of the future size Y^* of a variable Y, - e.g. an overall number of university students - going with a future value X^* of a variable X - e.g. time or number of high school students - one has available n observations $Y_1, Y_2, \dots, Y_n$, with mean $\bar{Y}$, corresponding to n values $X_1, X_2 \dots, X_n$ with mean $\bar{X}$. The Y-observations form one actualisation of an infinite number of sets of n observations, each set corresponding to the same n X-values; all potential Y_1-values have a mean $\mathcal{Y}_1$, the Y_2-values a mean $\mathcal{Y}_2 \dots$, etc. For simplicity we assume that $X_1, X_2, \dots, X_n$ represent years. Then

$Y_1 - \bar{Y}$ represents the change in Y between the first and the mean year;

$\mathcal{Y}_1 - \bar{Y}$ represents the "normal" expected change in Y over the same period;

$X_1 - \bar{X}$ is the length of that period in years (a negative number if X_1 precedes $\bar{X}$);

and finally

$\frac{\mathcal{Y}_1 - \bar{Y}}{X_1 - \bar{X}} = b_1$ is the "normal" average yearly rate of change in Y over the period from X_1 till $\bar{X}$.

Likewise

$\frac{\mathcal{Y}_2 - \bar{Y}}{X_2 - \bar{X}} = b_2$ is the "normal" average yearly rate of change in Y over the period from X_2 till $\bar{X}$.

The method of least-squares assumes these yearly rates of change to be equal whatever the period, hence

$$b_1 = b_2 = \dots = b_n = b$$

or

$$\frac{\mathcal{Y}_1 - \bar{Y}}{X_1 - \bar{X}} = \frac{\mathcal{Y}_2 - \bar{Y}}{X_2 - \bar{X}} = \dots = \frac{\mathcal{Y}_n - \bar{Y}}{X_n - \bar{X}} = b \qquad [1]$$

From this follows

$$y_i - \bar{Y} = b(X_i - \bar{X}) \qquad (i = 1,2,\ldots,n) \qquad [2a]$$

or equivalently

$$y_i = \bar{Y} + b(X_i - \bar{X}) \qquad (i = 1,2,\ldots,n) \qquad [2b]$$

or

$$y_i = a + bX_i \qquad (i = 1,2,\ldots,n) \qquad [2c]$$

with

$$a = \bar{Y} - b\bar{X} \qquad [3]$$

in which the generally used form [2c], though handy for the computation of an arbitrary Y^* by substituting X^* for X_i, is to be condemned for reasons which will become clear later on.

Since one does not know the "normal" values y_i, one cannot use [1] directly to compute the constant yearly rate of change b. However, if ν_i represents the deviation $Y_i - y_i$, one can transform [1] by means of the identity

$$y_i - \bar{Y} = (Y_i - \bar{Y}) - (Y_i - y_i) = (Y_i - \bar{Y}) - \nu_i$$

into

$$\frac{Y_1 - \bar{Y} - \nu_1}{X_1 - \bar{X}} = \frac{Y_2 - \bar{Y} - \nu_2}{X_2 - \bar{X}} = \ldots = \frac{Y_n - \bar{Y} - \nu_n}{X_n - \bar{X}} = b$$

In each fraction multiply the numerator and the denominator by the same number, viz. its denominator, then use the property that in a proportionality each proportion is equal to the proportion formed from the sums of the numerators and of the denominators respectively, to obtain

$$\frac{\Sigma(Y_i - \bar{Y})(X_i - \bar{X}) - \Sigma\nu_i(X_i - \bar{X})}{\Sigma(X_i - \bar{X})^2} = b \qquad [4]$$

The method of least-squares assumes further that the residuals ν_i are uncorrelated with the X_i ; as a consequence the second sum in the numerator of [4] vanishes, giving

$$b = \frac{\Sigma(X_i - \bar{X})(Y_i - \bar{Y})}{\Sigma(X_i - \bar{X})^2} \qquad [5]$$

For reasons to be mentioned below, it is preferable to compute b from the computational formula

$$b = \frac{\Sigma XY - (\Sigma X)(\Sigma Y) / n}{\Sigma X^2 - (\Sigma X)^2 / n} \qquad [6]$$

which we shall represent in condensed form by

$$b = \frac{(xy)}{(xx)} \qquad [7]$$

In the same way we write

$$\begin{aligned} \Sigma(Y_i - \bar{Y})^2 &= \Sigma Y^2 - (\Sigma Y)^2/n = (yy) \\ \Sigma(\mathcal{Y}_i - \bar{Y})^2 &= (yy)' \\ \Sigma(Y_i - \mathcal{Y}_i)^2 &= \Sigma v_i{}^2 = (yy)'' \end{aligned} \qquad [8]$$

Squaring [2a] and summing over i leads to

$$(yy)' = b^2(xx) = \frac{(xy)^2}{(xx)} = \frac{(xy)^2}{(xx)(yy)}(yy) = r^2(yy) \qquad [9]$$

in which

$$r^2 = \frac{(xy)^2}{(xx)(yy)} \qquad [10]$$

represents the square of the correlation coefficient r. On the other hand

$$(yy)'' = \Sigma(Y_i - \mathcal{Y}_i)^2 = \Sigma[(Y_i - \bar{Y}) - (\mathcal{Y}_i - \bar{Y})]^2 = \Sigma[(Y_i - \bar{Y}) - b(X_i - \bar{X})]^2$$

by [2a] , or developing the square :

$$(yy)'' = \Sigma(Y_i - \bar{Y})^2 - 2b\Sigma(X_i - \bar{X})(Y_i - \bar{Y}) + b^2\Sigma(X_i - \bar{X})^2$$

i.e.

$$\begin{aligned} (yy)'' &= (yy) - 2b(xy) + b^2(xx) \\ &= (yy) - 2bb(xx) + b^2(xx) = (yy) - b^2(xx) \end{aligned}$$

or

$$(yy)'' = (yy) - (yy)' \qquad [11]$$

This equation forms the basis of the variance-analysis table used in testing the presence of regression or time trends.

Table 1. VARIANCE-ANALYSIS FOR REGRESSION

Source of Variation	Sum of Squares	d.f.*	mean-square
trend	$(yy)'=r^2(yy)=b^2(xx)$	1	$r^2(yy)$
residual	$(yy)''=(1-r^2)(yy)$	n - 2	$(1-r^2)(yy)/(n-2)=s^2$
total variation	(yy)	n-1	$(yy)/(n-1) = s_y^2$

* degree of freedom.

If the computed trend is fictitious, i.e. a purely random phenomenon, then the so-called F-ratio between the trend mean-square and the residual mean-square does not differ significantly from (approximately) one. This F-ratio equals

$$F = \frac{(yy)'/1}{(yy)''/(n-2)} \qquad [12a]$$

$$F = \frac{r^2\,(n-2)}{1-r^2} \qquad [12b]$$

$$F = \frac{b^2}{s^2/(xx)} = \frac{b^2}{s_b^2} \qquad [12c]$$

since

$$\frac{s^2}{(xx)} = s_b^2 \qquad [13]$$

Therefore a test for trend is strictly equivalent to a test for significance of a correlation coefficient r or of a regression coefficient b.

2. One can rewrite [5] as follows

$$b = \Sigma w_i b_i \qquad [14a]$$

with

$$b_i = \frac{Y_i - \bar{Y}}{X_i - \bar{X}} \qquad [14b]$$

$$w_i = \frac{(X_i - \bar{X})^2}{(X_i - \bar{X})^2} \qquad [14c]$$

i.e. the yearly rate of change b is a weighted average of the n observed average b-s, the weights are proportional to the square of the length of the corresponding period. This fact entails preponderance for the first and last observations, and hence b is liable to bias due to aberrant Y_1 or Y_n -values.

However, the estimate b remains unbiased (i.e. the average of all possible estimates, each time based upon n observations made at the same moments $X_1, X_2, \ldots, X_n$, equals the "true" value β) consistent (i.e. one single estimate based upon all possible observations is equal to β), and lastly also efficient (i.e. b has the smallest variance among all estimators of β). The discoverer of the method of least-squares himself, C.F. Gauss, computes b by imposing the conditions of unbiasedness and minimum variance, i.e. the smallest sum of squares of deviations $b - \beta$; only after this derivation does he mention the property of least-squares for residuals (1); "valores maxime plausibiles (i.e. the most likely values for the regression coefficients) identici erunt cum iis per quos Ω (i.e. the sum of squares $\Sigma \nu_i^2$ of residuals ν_i) valorem minimum obtinet".

3. The margin of error of a forecasted value $Y^{\mathbf{x}}$ obtained by substituting $X^{\mathbf{x}}$ for X_i in equation [2b], is measured by var $Y^{\mathbf{x}}$, following from [2b]:

$$\begin{aligned} \text{var } Y^{\mathbf{x}} &= \text{var } \{\bar{Y} + b(X^{\mathbf{x}} - \bar{X})\} \\ &= \text{var } \bar{Y} + (X^{\mathbf{x}} - \bar{X})^2 \text{ var } b \\ &= \frac{\text{var } Y}{n} + (X^{\mathbf{x}} - \bar{X})^2 \frac{\text{var } Y}{(xx)} \end{aligned}$$

---

(1) GAUSS, C.F., Theoria Combinationis Observationum Erroribus Minimis Obnoxiae, in Werke IV, Göttingen, 1880, para. 21.

and is estimated by $s^2(Y^*)$, abbreviated to s^2_* :

$$s^2_* = s^2 . \left[\frac{1}{n} + \frac{(X^* - \bar{X})^2}{(xx)} \right] \qquad [15]$$

The derivation of [15] makes use of the fact that the variance of a sum equals the sum of the variances in case the terms are uncorrelated; now, $\bar{Y}$ and b are uncorrelated, whilst a and b are not; this is one of the reasons of our preference of [2a,b] against [2c] .

The second term within brackets is preponderant as soon as X^* represents a moment in time which is far removed from the base period. For equidistant time observations in a base period of n years one has

$$(xx) = \frac{(n - 1)\ n(n + 1)}{12} \qquad [16]$$

A forecast for time $X^* = 2n$, i.e. the last year of a forecasting period as long as the base period itself, leads to

$$\frac{(X^* - \bar{X})^2}{(xx)} \approx \frac{27}{n} \qquad [17]$$

this shows the variance s^2_* to be 28 times larger than at the mean of the base period, and 7 times larger than in the last-year of the base period.

A 95 per cent confidence interval for y^* is given by

$$\left[Y^* - t_{.975} s_* , Y^* + t_{.975}\, s_* \right] \qquad [18]$$

in which $t_{.975}$ represents that value of Student's t which is not exceeded by 95 per cent of all possible t-values for the number of degrees of freedom related to s^2. This interval is determined in such a way that, if it were computed in the same way for each possible set of n Y-observations, 95 per cent of such intervals would contain the true Y-value y^*. The interval [18] does not - as one would be inclined to think - contain 95 per cent of all possible alternative estimates for y^*.

D TESTS FOR ALTERNATIVE TREND SPECIFICATIONS

1. After fitting a linear trend to a series of observations, the question arises whether the trend was linear indeed. If an alternative specification is available (e.g. an exponential trend), one may determine under which specification the sum of squares for trend constitutes the largest fraction of the total sum of squares. This is equivalent to choosing the specification with the highest coefficient of determination (r^2 or R^2).

One can also fit orthogonal polynomials in X and test their respective contributions in explaining the remaining unexplained sum of squares of residuals. Such tests are negative in this sense, that they may indicate that a trend is not linear, but they cannot prove that a trend is linear; a polynomial of a higher degree may contribute significantly to the explanation, whereas a lower degree polynomial is not significant.

As an example we use Mertens' trend calculation for the concentration numbers of female students (1).

Table 2. TREND DETERMINATION FOR THE CONCENTRATION NUMBERS OF FEMALE STUDENTS

Source of Variation	Sum of Squares	d.f.	Mean-square	F-ratio
linear trend	38,405.54	1	38,405.54	280.6
linear residuals	1,368.71	10	136.87	
total variation	39,774.25	11		
quadratic trend	341.38	1	341.38	
quadratic residuals	1,027.32	9	114.15	2.99[1]
linear residuals	1,368.7	10		

(1) Not significant on the 5 per cent. level.
Test is negative in this sense that absence of linearity has not been proved.

The advantage of orthogonal polynomials in X above ordinary power series is that once a coefficient had been computed, it has not to be calculated again when adding higher degree terms. Again the advantage of [2b] over [2c] shows up; [2b] is in fact the development of Y into two orthogonal polynomials, viz. $\bar{Y}$, of zeroth degree in X, and $(X - \bar{X})$, of the first degree.

2. Several authors do not seem to know how to handle structural changes. They seem to be conscious of the inadequacy of their statistical technique which simply ignores these changes; therefore they accompany the statistical computations with "needed" comments in order to qualify the results; however, the evil is done since usually only the global end results of a forecast are remembered.

---

(1) Op. cit., p. 467, Table 1, fourth folumn

We thus deemed it useful to treat an example in which a structural change was clearly present, viz. the time series for the concentration numbers of male students in Mertens' contribution. For the sake of convenience we assume the change to have taken place exactly in the middle of the base period (actually the change probably took place one year later). Let X represent time (X = 1, 2, ..., 12 for resp. 1954, 1955, ..., 1965), and Y the concentration numbers. The preliminary computations are given in table 3 for the X-variable, while everybody can check the results for these simple numbers. Completely analogous computations for Y, and similar computations for XY are used also in table 4 in the columns labelled (yy) and (xy) resp. The (yy)' and (yy)" columns are computed by means of [9] and [11] from the entries in the same row. Table 3 shows why [6] is to be preferred to [5] : in computing b_W, b_B and b_T one can make use of terms computed for b_1 and b_2 ; moreover not a single average has to be computed.

Both partial trends show the same yearly rate of change (their graphs are parallel) when V_2/V_1 is not significantly large. The average Y-values of the partial periods follow a linear trend if V_3/V_{12} is not significantly large (in our example V_3 equals zero of necessity, because we considered only two partial periods, and two observation points can always be put on a same straight line). If the partial trends are equal, and if the means follow a linear trend, then the partial trend lines will coincide if V_4/V_{123} is not significantly large. In our example the abovementioned ratios are resp. less than one, equal to zero, and equal to 3.92; this last ratio is significant at the one-sided 5 per cent level of significance. From this fact we conclude that a structural change has occurred for which the second trendline lies distinctly higher than the first one, the slopes of both lines being equal; the average slope equals $b_W = 20.43$, which is the weighted average of $b_1 = 22.14$ and $b_2 = 18.71$, with weights equal to $(xx)_1 = 17.5$ and $(xx)_2 = 17.5$ (by chance the weighted and unweighted averages are identical). In the same way the slope $b_T = 25.73$ computed by Mertens is the weighted mean of $b_W = 20.43$ and $b_B = 27.44$ with weights $(xx)_W = 35$ and $(xx)_B = 108$; this means that the method of least-squares absorbs the upward jump of the structural change by yielding to high a figure for the slope; this slope does not equal 25.73 but, on the average before and after the jump, it equals only 20.43.

For a more accurate forecast it seems therefore advisable not to use the grand mean $\bar{Y} = 394.17$ for the whole base period, but the mean $\bar{Y}_2 = 476.5$ of the second partial period. The forecasting equation becomes:

$$y = \bar{Y}_2 + b_W(X - \bar{X}_2) = 476.5 + 20.43\,(X - 9.5) \qquad [19]$$

Table 3. PRELIMINARY CALCULATIONS (FOR X)

Source of Variations(x)		Sum of Squares	(Square of Sum) : n	S. of Sq. of deviations
Period 1(1)	$\Sigma X_1 = 21$	$A_1 = \Sigma X_1^2 = 91$	$B_1 = (\Sigma X_1)^2 : 6 = 73.5$	$A_1 - B_1 = (xx)_1 = 17.5$
Period 2(2)	$\Sigma X_2 = 57$	$A_2 = \Sigma X_2^2 = 559$	$B_2 = (\Sigma X_2)^2 : 6 = 541.5$	$A_2 - B_2 = (xx)_2 = 17.5$
Within periods (W)				$A - B = (xx)w = 35$
Between periods (B)				$A - C = (xx)_B^W = 108$
Total period (T)	$\Sigma X = 78$	$A = \Sigma X^2 = 650$	$C = (\Sigma X)^2 : 12 = 507$ $B = 615$	$A - C = (xx)T = 143$

(x) Between brackets: abbreviated notation used in Table 4.

Table 4. COVARIANCE ANALYSIS

	(xx)	(xy)	b	(yy)	d.f.	(yy)'	(yy)"	d.f.	Variance	Source of variation
1	17.5	387.5	22.14	9,078.8	5	8,580.3	498.5	4	124.6	Variation about trend 1
2	17.5	327.5	18.71	8,519.5	5	6,128.9	2,390.6	4	597.7	Variation about trend 2
						14,709.2	2,889.1	8	361.1=V_1	Variation about trends
						(x) - 102.8	102.8	1	102.8=V_2	Variation of trends
W	35	715	20.43	17,598.3	10	14,606.4	2,991.9	9	332.4=V_{12}	Variation within periods
B	108	2,964	27.44	81,345.3	1	81,345.3	0.0	0	0.0=V_3	Variation between periods
						95,951.7	2,991.9	9	232.4=V_{123}	Variation of periods
						(x)-1,301.1	1,301.1	1	1,301.1=V_4	Variation of means
T	143	3,679	25.73	98,943.6	11	94,650.6	4,293.0	10	429.3=V	Total variation

(x) Found by substraction.

Since for $X = 6{,}5$ one obtains $\overline{Y} = 394.17$, the new equation yields on the average figures which are $476.5 - [394.17 + 20{,}43\ (9.5 - 6{,}5)] = 476.5 - 455{,}5 = 21{,}0$ higher, but with a yearly rate of change which is $25.73 - 20{,}43 = 5.3$ less; up to 1963 the new formula yields higher figures for the concentration numbers, thereafter lower ones.

The variance of the estimate Y^* is not given any longer by 15 but by

$$s_*^2 = s_w^2 \left[\frac{1}{n_2} + \frac{(X^* - \overline{X}_2)^2}{(xx)_w} \right] \qquad [20]$$

in which

$$\begin{cases} s_w^2 = \dfrac{(yy)''_w}{n - k - 1} = V_{12} \\ k = \text{number of partial periods } (=2) \\ n_2 = \text{number of observations in period 2 } (=6) \end{cases}$$

C. THE USE OF A DEMOGRAPHIC BASIS

1. All forecasts of university student numbers use population figures. The question may be raised whether this is really necessary since the ultimate goal of the forecasts are absolute student numbers, not percentages of population studying. The answer should be emphatically negative unless marked population changes occur in the base and/or forecasting period. The latter being the case, a second question arises, viz. how to introduce population figures into the forecasts.

The intuitively simplest solution is to make forecasts of the percentages of students, to be multiplied by the presumed future population size. There are some methodological objections against such a procedure. Very strictly speaking, the population sizes in the various age groups are only estimates, which are random variables. A percentage of students thus is in fact a ratio of two random variables. Now, for such ratios, all statistical procedures are much more involved (1): an "average proportion" e.g. cannot be computed as the simple average of individual proportions, but as a proportion of averages (2).

---

(1) See e.g. A. MANDANSKY, Spurious Correlation due to Deflating Variables, in Econometrica, Vol. 32, 1964, p. 652.

(2) K. MERTENS, op. cit. comparé [6] with [7] on p. 476. The same remark applies to the probability limit of a ratio, but not to the expected value of a ratio. See e.g. T.N. SRINIVASAN, Least Squares and Conditional Prediction, in Econometrica, Vol. 33, 1965, p. 244.

Further, granting estimated age group sizes to be non-random numbers, the proportion S/B between students and population still are an estimate p of the probability p to do university studies. Such an estimate has a theoretical variance

$$\text{var}\ (p) = \frac{p(1 - p)}{B}$$

which in turn can be estimated through

$$s_p^2 = \frac{p(1 - p)}{B - 1}$$

These variances depend on B ; the deviations between the estimated and true proportions S/B will also depend on B, and B itself varies with time (otherwise the demographic variable should be left out from the analysis). In such a case, however, the method of least squares is not applicable: the calculation of b should have to be performed according to [4] while the method applies [5].

Conceding even to overlook this remark, and accepting the deviations to be uncorrelated with time, still the least-squares solution is not immediately applicable, because it presupposes all observations to have the same precision, or more accurately, to have the same variance. If this is not the case, generalised least-squares has to be used for "weighting" the observations, because otherwise the estimated b would not be unbiased.

As an example we may refer to table 4: in the next to last column the variances of both partial periods are mentioned, which barely fail to be significantly different.

The reader who has gone up to here may wonder whether recourse to statistics remains open. There is indeed a simple way out: to express the number of students as a function of both time and population size, and to compute this function by means of multiple regression. It is known that even in the case of multicollinearity between both explanatory variables the estimated regression function is still the best one available for forecasting although large fluctuations in the regression coefficients may be expected.

We shall now work through a numerical example, because the expression for the variance of a forecast estimate based upon multiple regression may be less well known. From the article by Mertens (1) we take the figure for female population B, and female student numbers Y for the period 1954-1965 (T = 0, 1, 2...,11); the population figures have been rounded to hundreds (the computations were performed manually). We get (without "coding") (1):

---

(1) See K. MERTENS, Prognose van de universitaire studentenbevolking tot 1970, Tijdschrift voor Economie, 1965, Nr. 4, table 1, p. 467.

$$\left\{\begin{array}{lcr} \Sigma B & = & 6,827 \\ \Sigma B^2 & : & 3,924,809 \\ -\frac{(\Sigma B)^2}{12} & : & -3,883,994 \\ \hline =(BB) & : & 40,815 \end{array}\right. \quad \left\{\begin{array}{lcr} \Sigma T & = & 66 \\ \Sigma T^2 & : & 506 \\ -\frac{(\Sigma T)^2}{12} & : & -363 \\ \hline =(TT) & & 143 \end{array}\right. \quad \left\{\begin{array}{lcr} \Sigma Y & = & 12,404 \\ \Sigma Y^2 & : & 14,881,728 \\ -\frac{(\Sigma Y)^2}{12} & : & -12,821,601 \\ \hline (YY) & : & 2,060,127 \end{array}\right.$$

$$\left\{\begin{array}{lcr} \Sigma BT & : & 38,394 \\ -\frac{(\Sigma B)(\Sigma T)}{12} & : & -37,548.5 \\ \hline =(\overline{BT}) & : & 845.5 \end{array}\right. \quad \left\{\begin{array}{lcr} \Sigma BY & : & 7,241,711 \\ -\frac{(\Sigma B)(\Sigma Y)}{12} & ; & -7,056,842 \\ \hline =(\overline{BY}) & : & 184,869 \end{array}\right. \quad \left\{\begin{array}{lcr} \Sigma TY & : & 84,059 \\ -\frac{(\Sigma T)(\Sigma Y)}{12} & : & -68,222 \\ \hline =(\overline{TY}) & : & 15,837 \end{array}\right.$$

$$(BT)^2 = 714,870.25 \qquad r^2 = \frac{(BT)^2}{(BB)(TT)} = 0.1225 = (0.35)^2$$

$$(BB)(TT) = 5,836,545 \qquad D = (BB)(TT)-(BT)^2 = 5,121,674.75$$

r^2 shows possible multicollinearity between both explanatory variables, viz. population and time.

$$\left\{\begin{array}{l} b_B = [(BY)(TT) - (TY)(BB)]/D = 2.566745 \\ b_T = [(TY)(BB) - (BY)(BT)]/D = 95.68954 \\ a = \overline{Y} - b_B\overline{B} - b_T\overline{T} = 1,033.67 - 1,460.35 - 526.3 - 952,98 \end{array}\right. \quad [23]$$

The regression equation becomes

$$\mathcal{Y} = 952.98 + 2.5667\mathcal{B} + 95.69\tau \qquad [24]$$

in 1969-70 we have $\tau = 16$, $\mathcal{B} = 680$, hence $\mathcal{Y} = 2,323$

The residual variance s^2 is derived from

$$(12 - 3)s^2 = (YY) - b_B(BY) - b_T(TY) = 70,182.42 \qquad [25]$$

The variance var $(\mathcal{Y})$ of $\mathcal{Y}$ is estimated by

$$s^2(\mathcal{Y}) = s^2.\{1/12 + [(TT)(\mathcal{B} - \overline{B})^2 - 2(BT)(\mathcal{B} - \overline{B})(\tau - T) + (TT)(\tau - T)^2]/D\} \qquad [26]$$

---

(1) For the notation used see eq. [7] and [8] e.g. $(BB) = \Sigma(B_i - \overline{B})^2$; $(BT) = (B_i - \overline{B})(T_i - T)$.

and amounts to

$$s^2(y) = 7,798.05 \quad 0,0833 + 0.7581$$

For 9 degrees of freedom the margin of error amounts to ± 183 at the 95 per cent confidence level. The statement that the true y lies somewhere in between 2,323 - 183 = 2,140 and 2,323 + 183 = 2,506 is one in a series of similar statements of which 95 per cent will happen to be true.

Strictly speaking it remains to be tested whether we were justified in including population together with time (or vice versa) as an explanatory variable in the regression equation. To this effect, we compute

$$r^2_{YB}.(YY) = (YT)^2/(TT) = 1,753,910.13$$

$$r^2_{YB}.(BB) = (BY)^2/(BB) = 837,352.6$$

$$(1 - R^2).(YY) = (n - 3) \; . \; s^2 = 70,183.42$$

and dress two analyses- of variance tables

Source of variation	Sum of Squares	d.f.	Mean-Square	F-ratio
regression on T	1,753,910.13	1		F > 30
difference (B,T)-T	236,033.45	1	236.033.45	
regression on (B,T)	1,989,943.58	2		
residual	70,183.42	9	7,787.05	
total	2,060,127	11		

Source of variation	Sum of Squares	d.f.	Mean-Square	F-ratio
regression on B	837.352.6	1		F > 144
difference (B,T)-B	1,152,691.0	1	1,152,691	
regression on (B,T)	1,989,943.6	2		
residual	70,183.4	9	7,787	
total	2.060,127	11		

Each time it appears that both variables are significant, though time alone explains more than population size taken separately.

2. Other authors complicate the problem still more by substituting hypothetical "weighted" age group sizes for the actual ones (1).

Let S_1 B_1 be student and population numbers in age group 1,

S_2 B_2 be student and population numbers in age group 2,

then the best estimate of the overall proportion is the ratio S/B or $(S_1 + S_2)/(B_1 + B_2)$; now, because the age distribution of the numerator is unknown, except for a few years for which all data have been tabulated, one weights the terms of the denominator with the ratios and for these few years. This procedure might possibly be defendable if these ratios were computed over a period in which B_1 and $B2$ remain approximately constant, but certainly not on the basis of one, two or four years right in the middle of the dip in birth numbers due to the war years.

II. HYPOTHESES USED IN THE FORECASTS OF THE UNIVERSITY STUDENT POPULATION

A. Introduction

As already stated in the introduction of this contribution, forecasts are based on hypotheses which specify the constancy of some parameters. Logically these hypotheses can be split into three statements concerning each parameter:

1° it is constant in the past;

2° it is constant in the future;

3° the constant value in the future will be equal to the constant value observed in the past. For forecasts concerning new establishments, one can replace the third statement by; "the constant value in the future for the region of the new establishment equals the constant value in the past of a region with similar structure and a similar establishment." The first published forecast e.g. concerned a newly to be established complete university or a polytechnical institute in Antwerp; it considered the province of Liège, with a complete university, and the province of Hainaut, with a polytechnical institute and two Schools of Business Administration, as in Antwerp, as similar regions.

---

(1) See Part II, B, 1-3-4; Part II, C, 1-2.

In not a single of the published forecasts the hypotheses were formulated explicitely, let be operationally. Even less were the supposedly constant parameters tested for constancy in the past (the only statistically verifiable of the three aforementioned statements which in this way might have become an established fact). To the defense of this lack of scientific mindedness one may argue that the method of least squares will swallow anything, but will retaliate by yielding such wide margins of error for the forecasts that these figures become useless for all practical purposes. This however implies that the confidence intervals 1) can be computed, 2) are in fact computed, and 3) are published. The often cited example of the Gallup-poll for the 1948 presidential elections in the U.S. might have been a warning not to omit this third point (1).

Lastly however, the statistical margins of error within the framework of a given set of hypotheses will be amply surpassed by the margins between results based on different sets of hypotheses (2) which a priori are equally likely.

As announced in the introduction, we now proceed to list explicitly the hypotheses used implicitly in the various forecasts.

B. FORECASTS FOR THE COUNTRY AS A WHOLE

1. N.C.S.R., I and II (3)

a) yearly increase of

$$\left(\frac{\text{number of new students}}{\begin{array}{l}\text{population of age 18 (in I) or}\\ \text{weighted population aged 17 up to 20(in II)}\end{array}}\right) \begin{array}{l}\text{is}\\ \text{cons-}\\ \text{tant}\end{array}$$

---

(1) See however K. MERTENS.

(2) See table 10, p.483, in K. MERTENS, o.c. supra.

(3) (NATIONAL COUNCIL FOR SCIENTIFIC RESEARCH), NATIONALE RAAD VOOR WETENSCHAPSBELEID, Verslag over de stijging van de studenten-bevolking, Brussels, 1961, pp. 104-105.
Id., Verslag over de expansie en aanpassing van het hoger onderwijs op universitair niveau, Brussels, 1964, pp. 25-31.

b) yearly increase of

$$\left\{ \frac{\text{number of new students}}{\text{total number of students}} \right\} \text{ is constant;}$$

Both hypotheses apply for both sexes jointly for the country as a whole.

In (I) the "new students" are referred to as : "18 to 19 year olds who start university studies", in (II) as: "Belgian students who start higher studies", or as "freshmen students". The figures used are in fact those concerning "new Belgian freshmen students of any age" ....

2. Coetsier I and II (1)

a) yearly increase of

$$\left\{ \frac{\text{number of students in a given group of studies}}{\text{population aged 17 through 26}} \right\} \text{ is constant}$$

for each sex and province separately, or for each sex in the country as a whole;

b) yearly increase of

$$\left\{ \frac{\text{number of students in a subgroup of a group}}{\text{total number of students in the group}} \right\} \text{ is constant}$$

for each sex and group of studies separately for the country as a whole.

3. Feldheim I (2)

Yearly increase of

$$\left\{ \frac{\text{total number of students}}{\text{weighted population aged 17 through 30}} \right\} \text{ is constant}$$

for each sex and faculty separately, or for each sex separately, for the country as a whole.

---

(1) L. COETSIER en E. VANSTEENKISTE, Sociaal-economische achtergronden van de democratisering van het universitair onderwijs, Gent, 1961, pp. 4-5. Id., Derde raming betreffende hoger universitair en niet-universitair secundair algemeen vormend en technisch onderwijs, Gent, 1964, pp. 3-10.

(2) CENTRE d'ETUDES DES PROBLEMES SOCIAUX ET PROFESSIONNELS DE LA TECHNIQUE, Prévisions de populations estudiantines dans l'enseignement supérieur, Bruxelles, 1960, pp. 4-8.

4. Feldheim II(1)

a) yearly increase of

$$\left\{\frac{\text{high school seniors}}{\text{weighted population of corresponding ages}}\right\} \text{ is constant}$$

for each sex and high school type separately for the country as a whole.

b) yearly increase of

$$\left\{\frac{\text{number of new freshmen from a given high school type}}{\text{number of corresponding high school seniors}}\right\} \text{ is constant}$$

for each sex and high school type separately for the country as a whole;

c) the proportion

$$\left\{\frac{\text{number of freshmen not from general humanities}}{\text{number of freshmen from general humanities}}\right\}$$

is constant for each sex separately for the whole country;

d) the proportion

$$\left\{\frac{\text{number of second-time freshmen}}{\text{total number of freshmen}}\right\} \text{ is constant}$$

for each group of studies for the whole country;

e) the proportion

$$\left\{\frac{\text{number of second-year students}}{\text{number of first-year students}}\right\} \text{ is constant}$$

for each group of studies for the whole country; the same is true (2) for subsequent years; these proportions will be called passing-coefficients.

f) the proportion

$$\left\{\frac{\text{number of new freshmen}}{\text{total number of students}}\right\} \text{ is constant (approximately 23 per cent).}$$

---

(1) Id., Prévisions des populations scolaires, Brussels, 1962, pp. 9-14.

(2) See below, Part III, 6.

5. CEPESS-report (1)

a) Yearly increase of

$$\left\{\frac{\text{number of 18 year old Belgian students}}{\text{population aged 18}}\right\}$$

is constant for each sex separately for the whole country

b) the proportion

$$\left\{\frac{\text{number of Belgian students aged 19}}{\text{number of Belgian students aged 18}}\right\} \text{ is constant}$$

for each sex separately for the whole country; the same is true for subsequent ages up to ages 25 and 24 respectively.

c) the proportion

$$\left\{\frac{\text{number of Belgian students between ages 18 to 25}}{\text{total number of Belgian students}}\right\}$$

is constant for each sex separately for the country as a whole.

6. Mertens (with Geens and Wieërs) (2)

a) cfr. 5a ;

a bis: the relative yearly increase of the proportion sub a. is constant ("exponential trend");

b) cfr. 5b ;

b bis: the yearly increase of the proportion sub b. is constant ;

c) cfr. 5c;

c bis: the yearly increase of the proportion sub c is constant.

Hypotheses b and c were used in unpublished preliminary forecasts, for which Mertens derived confidence intervals. Hypotheses b bis and c bis are used in the final version of the forecasts.

---

(1) CEPESS-Nota 862 IP/jl (mimeographed)

(2) *Op. cit.*

7. Matton I (1)

a) the proportion

$$\left\{\frac{\text{increase of total number of university students}}{\text{increase of total number of humanity high-school students, 4 years earlier}}\right\}$$

is constant for each Flemish province, for the province of Brabant, and for the country as a whole;

a bis (for the province of Limburg): the yearly increase of the proportion sub a is constant;

b) the humanity high-school population obeys Coetsier's forecasts which imply that the

yearly increase of

$$\left\{\frac{\text{number of high-school students}}{\text{population aged 15 through 19}}\right\} \text{ is constant for}$$

each sex and humanities-section separately for each province or for the country as a whole.

8. V.E.V. II (2)

a) yearly increase of

$$\frac{\text{number of students}}{\text{population aged 18 through 25}} \quad \text{is constant for}$$

each sex and province separately;

b) the number of French speaking students from the Flemish provinces is constant for both sexes jointly, and is equal to 1,350;

c) the number of Dutch speaking students from the Walloon provinces is zero;

d) the proportion

$$\left\{\frac{\text{number of Dutch speaking students from Brabant}}{\text{total number of students from Brabant}}\right\}$$

is constant and equals 25 per cent.

---

(1) J.G. MATTON, Vooruitberekening van het aantal universiteitsstudenten en gediplomeerden in de verschillende gewesten van België tot 1976, Gent, 1966, pp. 12-15.

(2) VLAAMS ECONOMISCH VERBOND - STICHTING UNIVERSITEIT ANTWERPEN, De oprichting van een rijksuniversiteit te Antwerpen, Antwerp 1962, pp. 49, 53.

C. PARTIAL FORECASTS (for each university separately):

1. Huyberechts en Brans:(1) for the University of Brussels:

a) yearly increase of

$$\left\{\frac{\text{number of high school freshmen}}{\text{weighted population of age 13 through 16}}\right\}$$

is constant for each sex and humanities-section separately for the country as a whole;

b) yearly increase of

$$\left\{\frac{\text{number of high-school seniors}}{\text{number of corresponding high-school freshmen}}\right\}$$

is constant for each sex and humanities-section separately for the country as a whole;

c) yearly increase of

$$\left\{\frac{\text{number of new freshmen students at Brussels}}{\text{number of corresponding high-school seniors, weighted}}\right\}$$

is constant for both sexes jointly for each faculty separately or for the whole university;

d) yearly increase of

$$\left\{\frac{\text{number of students at Brussels}}{\text{number of corresponding high-school seniors weighted twice}}\right\}$$

is constant for both sexes jointly for each faculty separately or for the whole university;

- the double weighting is performed

1. by humanities-section, according to its percentage-wise representation in a given faculty;

2. by calendar years in the past, according to the percentage of students registered in a faculty having completed high-school studies in that year;

e) yearly increase of number of foreign students at Brussels is constant.

---

(1) S. HUYBERECHTS - J.P. BRANS, Perspectives d'évolution de la population scolaire en Belgique et de la population estudiantine de l'Université libre de Bruxelles, Cahiers du Centre de Mathématiques et de Statistiques appliquées aux Sciences Sociales, 2, Brussels, s.d., pp. 45-108.

2. Programming Office of Liège University (1) :

a) cfr. C_{1a} , for the whole country, and for the Walloon provinces;

b) yearly increase of

$$\left\{\frac{\text{number of new freshmen students at Liège}}{\text{number of corresponding high-school freshmen, in Wallonia}}\right\}$$

is constant for each sex separately;

b bis yearly increase of

$$\left\{\frac{\text{number of new freshmen students at Liège}}{\text{number of Walloons aged 18}}\right\}$$

is constant for each sex separately;

b ter yearly increase of

$$\left\{\frac{\text{number of new freshmen students at Liège}}{\text{number of corresponding Walloon high-school seniors}}\right\}$$

is constant for each sex separately;

c) the proportion

$$\left\{\frac{\text{number of new freshmen students at Liège}}{\text{total number of students at Liège}}\right\}$$

is constant and equal to 21 per cent.

3. De Lanoo (2), for the University of Leuven (Louvain)

a) yearly increase of

$$\left\{\frac{\text{number of new "Belgian" students}}{\begin{matrix}\text{population aged 18-19-20 (males)}\\ \text{17-18-19 (females)}\end{matrix}}\right\} \text{ is constant}$$

for each sex and province separately for both language sections jointly;

---

(1) SERVICE DE PROGRAMMATION, L'évolution passée et future de la population de l'université de Liège, Liège, 1961, pp. V 11 - 17 (mimeographed).

(2) I. DE LANOO, De Leuvense Studentenbevolking, Politica, Vol. 14, 1964, special issue, pp. 12-24.

b) yearly increase of

$$\left\{\frac{\text{number of new "foreign" students}}{\text{number of new "Belgian" students}}\right\} \text{ is constant}$$

"Belgian" means: of Belgian nationality and living in Belgium;

"foreigner" means: of foreign nationality or not living in Belgium;

c) yearly increase of

$$\left\{\frac{\text{number of new freshmen students}}{\text{total number of new students}}\right\} \text{ is constant for}$$

both sections and language sections jointly;

d) yearly increase of

$$\left\{\frac{\text{number of new freshmen students in a group of studies in a language section}}{\text{total number of new freshmen students of the given language section}}\right\}$$

is constant;

d bis: yearly increase of { number of new freshmen students in a group of studies in a language section } is constant;

d ter: { number of new freshmen students in a group of studies of a language section } is constant;

e) the proportion

$$\left\{\frac{\text{number of new freshmen students}}{\text{total number of freshmen students}}\right\} \text{ is constant}$$

the proportion

$$\left\{\frac{\text{number of second-year students}}{\text{number of first-year students}}\right\}$$

is constant (likewise for subsequent years) for each group of studies of a language section separately.

4. V.E.V.(1) : for a new establishment in Antwerp;

a) the proportion

---

(1) VLAAMS ECONOMISCH VERBOND, Werkgroep, "Wetenschappelijk Onderzoek", De Technisch-Wetenschappelijke Ontwikkeling en de Expansie van het Antwerps Industriegebied, Antwerp, 1959, pp. 103-107, 108-110, 111-113.

$\left\{\frac{\text{number of students}}{\text{number of conscripts}}\right\}$ for the province of Antwerp,

for the future, is equal to the same proportion for the province of Liège in the past (strictly speaking : in 1957);

b) the proportion

$\left\{\frac{\text{number of conscripts}}{\text{total population}}\right\}$ for the province of Antwerp

is the same for the future as in the past (viz. in 1957);

- combining a) and b) leads to an estimate of the total number of students for the province of Antwerp;

c) the proportion

$\left\{\frac{\text{number of students}}{\text{total population}}\right\}$ for the future will be the

same for the arrondissement Sint-Niklaas as for the province of Antwerp;
(this way the future number of students from Sint-Niklaas is estimated);

d) the proportion

$\left\{\frac{\text{number of students in engineering}}{\text{total number of students}}\right\}$ for Antwerp and

Sint-Niklaas for the future is equal or larger than the corresponding proportion for the whole of Belgium in the past;

e) the future regional surplus for Antwerp as against Belgium will be equal to the surplus of Hainaut in the past; this surplus is equal to a fraction of the proportion sub d), the fraction being equal to the difference of the proportions sub d) for Hainaut and Belgium in the past;

f) analogous to d) for science students;

g) the future regional surplus for Antwerp for science students is determined as sub e), with the difference fraction for engineering students reduced by the ratio for Belgium of the total number of engineering students to the total number of science students;

h) the proportion

$\left\{\frac{\text{number of students studying in the region}}{\text{total number of students}}\right\}$

for engineering and science students from Antwerp and Sint-Niklaas, in the future, is equal to either the corresponding proportion for engineering students in Hainaut in the past, or to the corresponding proportion of business science students in Antwerp in the past;

i) the proportion

$$\left\{\frac{\text{number of students not from the region but studying there}}{\text{number of students from the region and studying there}}\right\}$$

follows the same hypotheses as sub h).

5. Matton, for the University of Ghent separately

a) yearly increase of

$$\left\{\frac{\text{number of students from Flemish Belgium and Brussels at Ghent}}{\text{total number of students from Flemish Belgium and Brussels}}\right\}$$

is constant - for each province or each arrondissement separately;

a bis : 1° idem as sub a) for the provinces of Antwerp and Eastern-Flanders, the arrondissements Brussels, Bruges and Ostend, and for Flemish Brabant;

2° for the remaining arrondissements: {number of students from the arrondissement at Ghent} for the future is constant, and equal to the number in 1965-1966;

b) the proportion

$$\left\{\frac{\text{number of students from a given arrondissement at Ghent}}{\text{total number of students}}\right\}$$

for the future is constant, and equal to its average over the last three years;

b bis: for the province of Antwerp this proportion is equal to the average over the last twelve years.

III. DISCUSSION OF FORECASTING METHODS

We limit ourselves to the points touched upon in the first part of this contribution.

1. NCSR (I) :

Uses ratios, not only with respect to population, but also of two random variables (freshmen students over total student population). This last ratio had better be represented **upside down**, so as to be able to multiply it with the estimated number of first-year students.

By way of parenthesis it should be mentioned that the conclusion: "The influence of factors extraneous to the social-economic structure, such as the existence of a university, has therefore to be considered as marginal" (1), has to be rejected. To disprove the hypothesis that the propensity to study is determined by the proximity of a university, it is not sufficient to prove another hypothesis to be true.

2. NCSR (II) :

The same remarks as for the first publication apply also here. The weighting of the hypothetical population had better be left out the more so as the weights are based upon the figures for only one academic year, viz. 1962-63, for which the age group of ages 17 through 20 goes back upon the strongly changing birth numbers of 1942 through 1945: the percentage of 17 and 18 year olds has thus been underestimated. Differentiation according to sex and language section is also desirable. The structural change in the evolution of concentration numbers of freshmen students between 1958 and 1959 was noticed, but apparently one did not know how to handle it.

This publication, by means of graphs, convincingly shows the regional pull of a university.

3. Coetsier (I) :

This author writes: (2) "A projection is nothing more than an estimate of the most probable data under specified and reasonable hypotheses. Our projections are conditioned provisions;

---

(1) Op. cit. p. 60, footnote 4, in fine, p. 61.

(2) Op. cit. p. 5.

for they suppose that the combined effect of the forces acting in the past will continue in the same direction. It is peculiar to this method that the room for fluctuations, i.e. the susceptibility for unforseeable deviating influences, will increase with the duration of the forecasting period".

The hypotheses are nowhere specified, let be tested for their reasonableness, the conditions under which the "conditional previsions" apply are not mentioned, the "room for fluctuations" is not computed.

A whole array of socio-economic variables, not however the proximity of a university, serves to explain the participation in university education. The structural gap, in the spatial series of the 9 provinces, between the Flemish and Walloon part of the country, has been overlooked flagrantly.

4. Coetsier (II) :

The passage (1) "Of the at the 5 or 1 per cent level significant trends, we furthermore determine the upper and lower limit which, under constancy of the factors at work, will not be exceeded with a probability of 19 chances out of 20" is an example of the misconception which we tried to righten, sub I A_3.

Confidence intervals are now indicated, except in those cases where the trend slope did not differ significantly from zero. This however simply means that the time variable plays no role in the explanation of an unexistent evolution; one should simply have indicated the confidence interval for the historic average.

Two sets of forecasts were calculated, for base periods of respectively 7 and 8 years, starting in 1953-54. Due to the structural change which occurred thereafter, much of this material is now outdated as to the forecasts. However it could be very useful to pinpoint the structural change as to province, sex and group of studies.

5. Feldheim (I)

This forecast was one of the first to use a weighted population. How this was done is explained as follows (2): "Nous avons relevé pour les deux sexes la population par année d'âge dans chaque faculté des universités, de manière à établir pour chaque âge un poids statistique applicable à la distribution globale préalablement déterminée. En procédant ainsi, nous avons obtenu la population théorique annuelle susceptible d'être inscrite dans une faculté déterminée". For how many calendar years this was done is not revealed.

---

(1) Op. cit. p. 7.

(2) Op. cit. p. 5.

Further on the author states (1) : "lorsque l'évolution passée faisait apparaître nettement deux tendances successives, l'on a préféré projeter suivant la tendance la plus récente." The author might find in this contribution a method to test the "nettement" in an objective statistical way and to combine parallel trends.

A formula to compute confidence intervals is indicated, the results of these computations are not. One has to glean oneself the regression coefficients from the time series forecasts.

6. Feldheim (II)

The distribution over groups of studies of freshmen students was examined in 14 academic years. "On a étudié l'évolution de ces coefficients, et on a déterminé leurs valeurs futures, à l'aide de péréquations graphiques portant sur les séries de pourcentages inscrites sur des diagrammes représentant pour l'usage un enregistrement cumulé". This procedure is not suitable for statistical tests. The same can be said for the whole study, in which not a single data series is published nor any source of material quoted.

7. CEPESS - note

The inherent weakness of a forecast based upon passages over age years instead of over study years is that two phenomena are intermingled: the change in age at the beginning of higher studies, and the change in proportion passing from one study year to the next. E.g., when the passage coefficient between 18 and 19 year olds amounts to 160 per cent, maybe of 100 freshmen aged 18, only 40 were left as 19 year olds (either in second year or doing over again the first year of studies) and 120 new 19 year old freshmen students (or newly arrived students in higher years of study) were added. True, one avoids difficulties in connection with second licence and aggregation years (combined M.A.T. and M.A. or M.Sc. degrees), medical studies, etc. The specification of hypotheses could certainly be improved.

---

(1) Op. cit. p. 6.

The elaboration of the hypotheses also shows some weaknesses. Actually, the authors did not use absolute figures to compute concentration coefficients (the proportion in their hypothesis a)), but indices with 1954 figures as a basis; this simply implies that they start out by dividing all subsequent year figures by the base year figure, and end up by multiplying the results by the same base figures, two operations which simply cancel out each other. The trend increase is a simple unweighted average of yearly increments. The calculation of average passage coefficients was done by averaging ratios; such an average is not consistent (in Dutch: not usable; the Dutch term clearly stresses the uselessness of such an estimating procedure).

8. Mertens (with Geens and Wieërs)

The array of hypotheses was the same as in the foregoing forecast (CEPESS). By his scientific earnestness and methodological craftsmanship the main author succeeded in refining the hypotheses and maybe in getting nearer to the truth. In the first place he preferred an exponential trend for the short term (up to 1970) evolution in female student numbers (in this contribution we showed by way of illustration, that the trend was perhaps linear, i.e. that a linear trend might have been justified).

Furthermore he avoided the use of inconsistent ratio estimates (one little remark: the consistent estimate is not unbiased because we have a regression line going through the origin, but because it is a straight line) ; in this way he hit upon the idea to compute regression estimates for the passage coefficients (and hence he replaced hypotheses b) by hypothesis b bis if needed).

From his posthumous article on the confidence limits of his forecasts again appears his scientific concern. Personally I can testify that he only reluctantly left out this part from his main contribution because he felt it not yet to be ready.

9. Matton (I)

The weakness of this contribution is, that it is based upon forecasts of the number of high school students; these forecasts are subject to large margins of error. The correlation coefficients obtained lead to coefficients of determination R^2 of size 0,889 - 0.722 - 0,731 - 0,803 - 0,968 which fall markedly below the values obtained by Mertens. True, the cause may be that computations were done on the level of the province whereas Mertens computed forecasts for the country as a whole. Possibly the prognoses could be improved by using non-integer time lags.

10. V.E.V. (II)

The regression equations for the trends are not published, only the graphs for the Flemish and Walloon provinces, Brabant and the whole of Belgium. The aforementioned statement of the N.C.S.R. is conclusively refuted.

11. Huyberechts and Brans (Brussels)

The weighting of age groups of high school freshmen (aged 13 through 16) was done on the basis of data gathered over two school years (1956-1958); these correspond precisely to the birth years 1940-1945, so that one would be hard put to find a worse period. The base of the forecasts pyramid is very unreliable.

The trend equations are not mentioned, but one can read off the constant yearly increments from the published data sets. No mention is made of the reliability of the results.

12. Programming Office of Liège University

This contribution is interesting mainly from a Liège and Walloon view-point. The analysis of failure rates is also interesting. This study offers a good example of the way in which short cuts such as graphical analyses and educated guesses can lead to acceptable forecasts which can be useful for decision-making in the management of the university. The pronounced regional recruitment of Liège surely was an advantage in this case.

13. De Lanoo (Leuven)

The set of hypotheses wrought into this study is one of the most precise and systematic ones, and has to be counted as a big plus in comparison to other forecasts.

The methodological weakness which this study shares with most other ones, is that ratios of random variables have been used.

14. V.E.V. (I) (new establishment in Antwerp)

This is an example of ingenious but very plausible hypotheses in a situation where one had to hazard previsions for a planned institution of higher education. The lack of basic data was successfully met by specifying alternative hypotheses which permitted the determination of a minimal and a maximal estimate.

15. Matton (II) (Ghent)

The method of this author ressembles that of the abovementioned V.E.V. - contribution; the estimation of the margin of error is done by specifying alternative hypotheses. The limited amount of data on the arrondissement level permits averages only over a period of three years.

SUM OF UNIVERSITY TOTALS (1)

	1969-70	1970-71
Ghent	8,199	8,375
Brussels (2)	11,176	11,767
Louvain (2)	26,843	28,164
subtotal	46,218	48,306
Liège (3), (2)	8,156	8,525
total	54,374	56,831

---

(1) Schools of Business Administration not included.

(2) Foreigners included.

(3) Put equal to 15 per cent of the total, i.e. 15/85 of the subtotal.

CONCLUSIONS

In almost all forecasts division by population size is performed. It is preferable, and simpler, to use multiple regressions upon time and population.

The forecasts of Coetsier and Feldheim (I), Matton and V.E.V. use totals over all years of study, the others estimate first either the number of freshmen students (Feldheim (II), Huyberechts and Brans, "Liège"), or new freshmen students (N.C.S.R. I and II), or new Belgian students (De Lanoo), or 18 year old students (CEPESS, Mertens). These others thus had to estimate passage coefficients, which was not always done properly.

Many authors did spare neither time nor pains to gather important statistics; we regret however that some do not publish this material; it makes verification impossible - to which science has the inalienable right and the imperative duty - and it would have saved much double work. By stressing the importance of statistical material, many relegated statistical methods to the second place. From the way in which they handle the term "hypothesis" it appears that more often than not they could not dominate sufficiently the computational labour in order to be able to have a synthetic overall view of their work, and to plan their computations in such a way that hypotheses had to be formulated beforehand clearly and explicitly. We tried to fill this gap.

SYNOPSIS OF FORECASTS

Source	forecast for		Yearly increase		Basic data		Foreigners included
	1969-70	1970-71	of	pct/yr	Period	Nr. of y.	
NCSR 1	49,639	50,927	(new students / population aged 18)	0.301	1948-49 thr.1959-60	12	yes
NCSR 2	44,839	46,550	(new students / weight pop. 17 thr.20)	0.274	1948-49 thr.1962-63	15	yes
Coetsier 1	49,262	-	-	-	1953-54 thr.1959-60	7	?
Coetsier 2	39,247M 9,728F 48,975T	41,455M 10,652F 52,107T	(Total nr students / Pop. 17 thr. 26) (M) do. (F)	0.205 0.063	1953-54 thr.1960-61	8	yes ?
Feldheim 1	36,908M 9,733F 46,641T	38,669M 10,225F 48,894T	(total nr of students / weight pop. 17 thr.30) (M) do. (F)	1.65 1.54	1948-49 thr.1958-59	10	no
	35,988M 9,566F 45,554T	37,666M 10,032F 47,698T	do.	1.55 1.52	do.	11	no
Feldheim 2	40,797M 11,261F 52.058T	42,051M 11,681F 53.732T	-	-	?	?	?

CEPESS	47,112M 12,683F 59,795T	-	$\left(\frac{\text{students aged 18}}{\text{population aged 18}}\right)$ (M) do. (F)	0.229 0.120	1953-54 thr.1958-59 -	6	?
do.-Wieërs	52,049	-	?	?	1948-49 thr.1959-60	12	?
	59,187	-	?	?	1954-55 thr.1959-60	6	?
do.-Delcourt	44,302	-	?	?	1948-49 thr.1958-59	11	?
	50,948	-	?	?	1954-55 thr.1958-59	5	?
a.	41,745M 13,685F 55,430T	-	$\left(\frac{\text{students aged 18}}{\text{population aged 18}}\right)$ (M) do. (F)	0.257 0.164	1953-54 thr.1964-65	12	no
b. Mertens	41,745M 16,098F 57,843T	-	do. (M) $\left(\frac{\text{increase in stud. aged 18}}{\text{students aged 18}}\right)$ (F)	0.257 9.4	do.	12	no
c.	45,225M 13,875F 54,100T	-	see a.	see a.	do.	12	no
V.E.V.		40,027M 10,565F 50,592T	-	-	1951-52 thr.1960-61	10	no ?
Matton	58,976	61,128	-	-	?	?	no
	59,102	63,370	-	-	?	?	yes

NEW ASPECTS OF THE PROBLEM OF THE GEOGRAPHICAL EXPANSION OF HIGHER EDUCATIONAL ESTABLISHMENTS

by

Dr. P. COETSIER and A. BONTE

The geographical location of new higher educational establishments is usually studied with reference to the following factors :

- population potential;
- existing proportion of young people in higher education establishments;
- social, cultural and industrial development;
- infrastructure;
- geographical situation of the regions concerned.

If such studies are undertaken in order to work out a development policy for widespread regions, e.g. at international level, the above factors may be enough. If, however, we wish to draw up a policy for a small country where, in view of the size, the density of the establishments is already reasonable, a number of other factors must also be taken into account.

When envisaging the creation of new establishments and the geographical expansion of university education, the value of what the region has to offer at university level is very important. A similar problem arises every time there is a wave of wider social admission to higher education. It is not enough, therefore, to assess to what extent the various age groups are already enrolled in educational establishments in a particular region: at the same time as the population potential is examined, the quality of the human resources available must also be considered. It is possible that in a given region, quantitatively speaking, enrolment is low, but that the quality of the human potential there in no way justifies the creation of a higher educational establishment.

Quantitative insufficiency often goes hand in hand with qualitative deficiency. In this case young people are not properly prepared for higher education, either owing to the lack of suitable secondary establishments or because of wrong orientation. At the beginning of secondary school, an unfortunate choice by parents may thus bar access to the university.

While the frequency of wrong orientation at secondary level varies considerably according to region, it can certainly not be attributed to geographical inaccessibility of the university. Not only the quality of the available potential should therefore be known, but also the proportion of the age group enrolled and its structure in the region. It may then seem preferable to concentrate at first on methods to improve the existing secondary network rather than create new establishments, or even on trying to change mental attitudes in the region.

Our study "Topography of the intelligence potential available in Belgium and the Inter-regional Disparity in Enrolment in Education" (1) discusses two important aspects of the problem of the geographical expansion of higher educational establishments. The study is based on a oomparison of two sets of data: on the one hand, the quantitative enrolment in various types of education for each region, i.e. for each canton - in other words, the proportion of each age group enrolled and its pattern; on the other hand, the average level of intelligence for the same age groups for each region. The intelligence level is determined globally and for each type of education.

The study is based on data relating to four groups of Belgian youths called up for military service (groups called in 1961, 1962, 1963 and 1964), who form a very representative sample of the young male population. For these conscripts the data available included: origin, educational level and I.Q.s. Using the results of their psychological tests, we determined psychometrically the average intelligence level for conscripts originating from each canton and for each educational level.

To determine the average enrolment and intelligence level in a particular canton, the enrolment coefficients in each type of education and the average obtained for the canton in the psychological tests were compared with the average for Belgium. Levels were fixed on the basis of a standard deviation of 0.5σ from this average. The following table shows the results of this exercise and the percentage of cantons for each level.

---

(1) "Topografie van het beschikbaar begaafdheidspotentieel in België en ruimtelijke verschillen in scolarisatiepatroon" by Dr. P. Coetsier and Lic. A. Bonte. Communications of the Applied Psychology Laboratory and the Studies Advisory Service, No. 28, 1966.

Level	Deviation in σ from the average M	Percentage of cantons
1	less than $M - 2.25\sigma$	1.22
2	from $M - 2.24\sigma$ to $M - 1.75\sigma$	2.79
3	from $M - 1.74\sigma$ to $M - 1.25\sigma$	6.55
4	from $M - 1.24\sigma$ to $M - 0.75\sigma$	12.10
5	from $M - 0.74\sigma$ to $M - 0.25\sigma$	17.47
6	from $M - 0.24\sigma$ to $M + 0.25\sigma$	19.74
7	from $M + 0.26\sigma$ to $M + 0.75\sigma$	17.47
8	from $M + 0.76\sigma$ to $M + 1.25\sigma$	12.10
9	from $M + 1.26\sigma$ to $M + 1.75\sigma$	6.55
10	from $M + 1.76\sigma$ to $M + 2.25\sigma$	2.79
11	$M + 2.26\sigma$ and over	1.22

For each canton we thus obtain:

1. Average level of intelligence of all conscripts in the canton compared with the average for Belgium (white histogram in each canton on map No.1).

2. Average level of intelligence of conscripts who with a particular form of secondary or higher education compared with the corresponding average for Belgium (black histogram in each canton on map No. 1).

3. Enrolment per canton for a given type of education compared with the average for Belgium (dotted histogram on map No.1).

Intelligence levels and enrolment are represented as follows:

- low levels, i.e. levels 1 - 5 appear below this axis; the horizontal divisions indicate the divergence from the average;

- high levels, i.e. levels 7 - 11 appear above the axis and the divisions indicate the divergence from the average.

Charts were prepared for each type of secondary and higher education. We shall discuss only university education here.

The attached maps show the main results. Levels 8 - 11 are here considered as high levels, representing almost one-quarter of the total cantons. Levels 5 - 7, covering just over half the cantons, are regarded as average levels. Low levels, i.e. levels 1 - 4, cover about one-quarter of the cantons.

Map No.2 shows the regions with high, average and low intelligence levels.

Map No.3 shows university enrolment in each region.

Map No. 4, "Utilisation of the intelligence potential at university level", is obtained by comparing average intelligence in each canton with university enrolment.

Maximum utilisation is achieved when a canton's university enrolment shows a difference, at least two levels above the average intelligence level for the canton. Minimum utilisation is made when enrolment shows a difference of at least two levels below the average intelligence level for the canton. Average utilisation indicates equilibrium between university enrolment and the average intelligence level for the canton.

The interpretation of these maps clearly shows that the geographical expansion of higher education involves more complex data than appears at first sight. In addition to such factors as population potential, social, cultural and industrial development, infrastructure and geographical situation, it is necessary to take account of these two new aspects - intelligence potential and enrolment patterns in the regions concerned.

REUTILISATION OF INTELLIGENCE POTENTIAL AT UNIVERSITY LEVEL IN BELGIUM

The provinces of Brabant and Liège have by far the highest university enrolment in the country (see map 3). Next come the provinces of Namur and Luxemburg, where the proportion of graduates is above the average for Belgium. In all other provinces enrolment is below the average for Belgium.

Limburg and East Flanders have the lowest figures. Of the Flemish provinces, Antwerp has the highest enrolment rate.

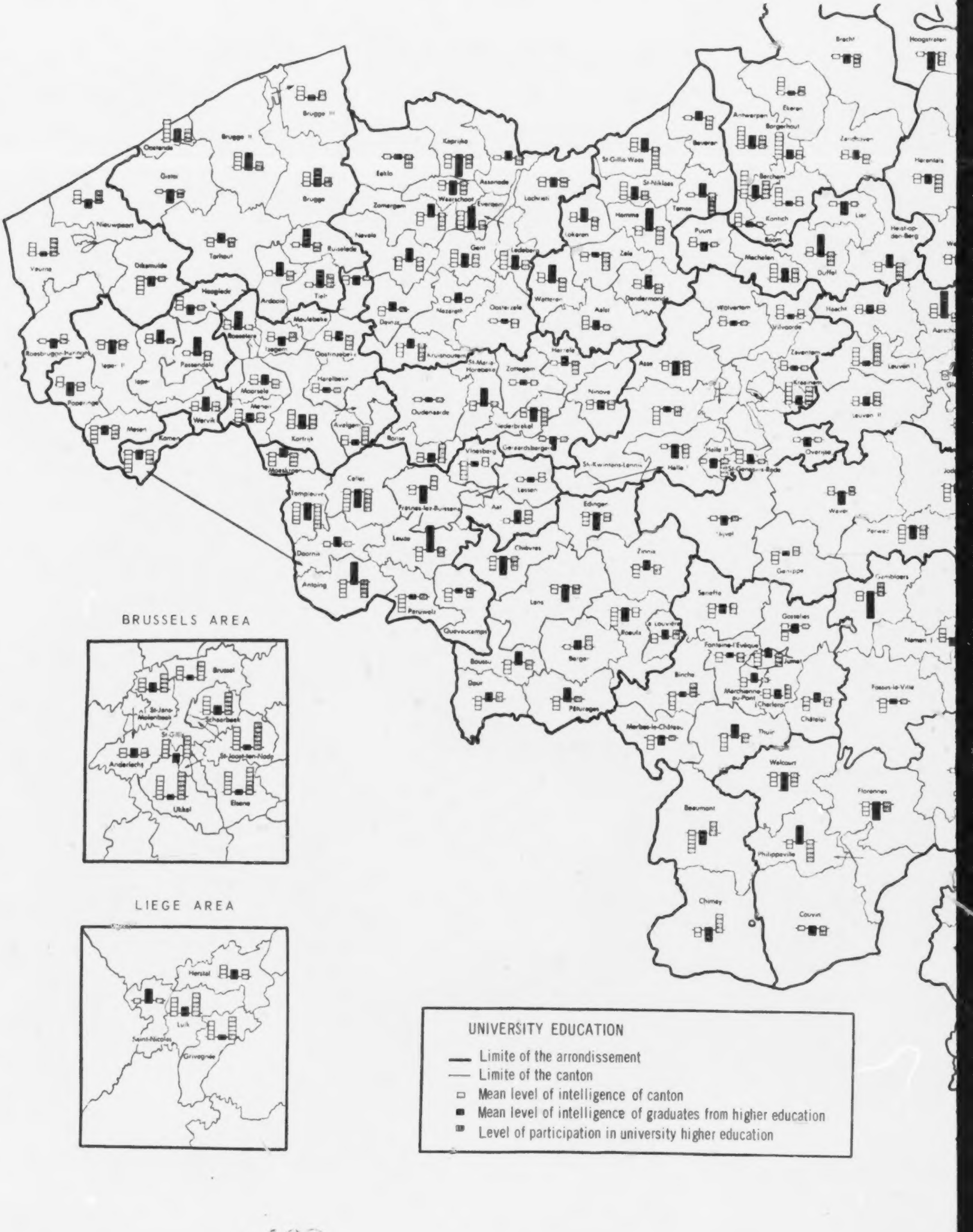
If the available data are analysed at a more restricted operational level, the intelligence potential available clearly differs according to region and utilisation is by no means uniform.

Province of Brabant

The province of Brabant is dominated by Greater Brussels, where intelligence averages are very high (see map 2). This may be explained by the socio-economic advantages in Brussels and their atrraction for those sections of the population with higher education. According to the 1961 population census, the highest density figures for university graduates were returned for the cantons of St.Josse-ten-Node, Ixelles and

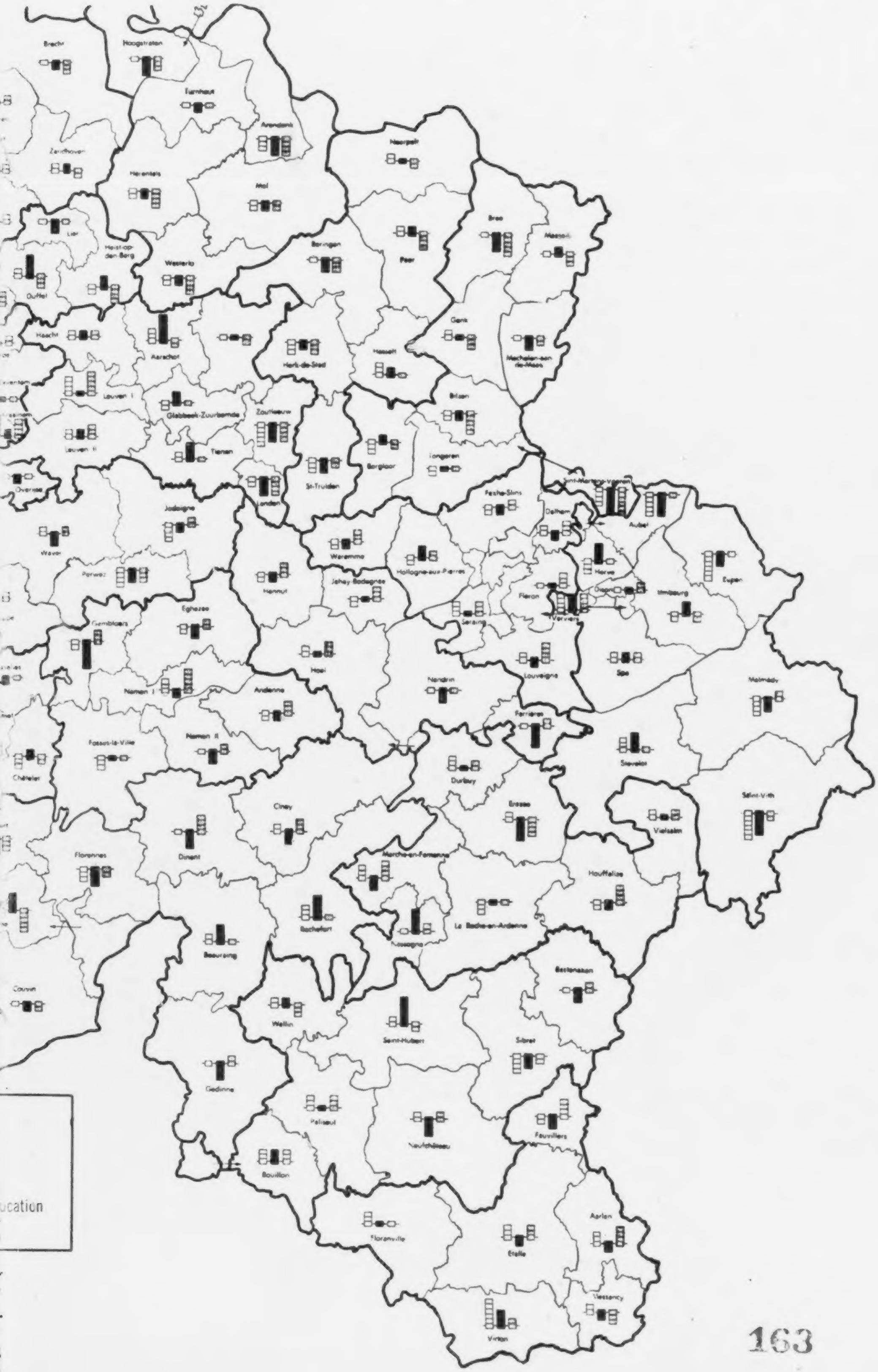
Map 1

UNIVERSITY HIGHER EDUCATION


BRUSSELS AREA
LIEGE AREA
UNIVERSITY EDUCATION
Limite of the arrondissement
Limite of the canton
☐ Mean level of intelligence of canton
■ Mean level of intelligence of graduates from higher education
▥ Level of participation in university higher education
Brugge III
Brugge II
Brugge
Oostende
Gistel
Nieuwpoort
Veurne
Diksmuide
Torhout
Roeselare
Ieper
Poperinge
Wervik
Menen
Kortrijk
Moeskroen
Eeklo
Kaprijke
Assenede
Zomergem
Nevele
Gent
Lochristi
Ledeberg
Lokeren
Wetteren
Aalst
Dendermonde
Zele
Hamme
St-Niklaas
St-Gillis-Waas
Beveren
Temse
Oudenaarde
Ronse
Zottegem
Ninove
Geraardsbergen
Lessen
Aat
Edingen
Halle
Asse
Vilvoorde
Wolvertem
Zaventem
Kraainem
Leuven I
Leuven II
Overijse
Haacht
Aarschot
Wavre
Perwez
Genappe
Nivel
Mechelen
Duffel
Lier
Heist-op-den-Berg
Puurs
Boom
Kontich
Berchem
Borgerhout
Ekeren
Antwerpen
Brecht
Hoogstraten
Zandhoven
Herentals
Doornik
Antoing
Tempeuve
Celles
Frasnes-lez-Buissenal
Leuze
Chièvres
Peruwelz
Quevaucamps
Lens
Zinnik
Roeulx
La Louvière
Boussu
Dour
Pâturages
Bergen
Binche
Seneffe
Gosselies
Jumet
Fontaine-l'Evêque
Marchienne-au-Pont
Charleroi
Châtelet
Thuin
Merbes-le-Château
Beaumont
Walcourt
Philippeville
Florennes
Chimay
Couvin
Gembloers
Namen
Fosses-la-Ville
Brussel
St-Jans-Molenbeek
Schaarbeek
St-Gillis
St-Joost-ten-Node
Anderlecht
Ukkel
Elsene
Herstal
Luik
Saint-Nicolas
Grivegnée

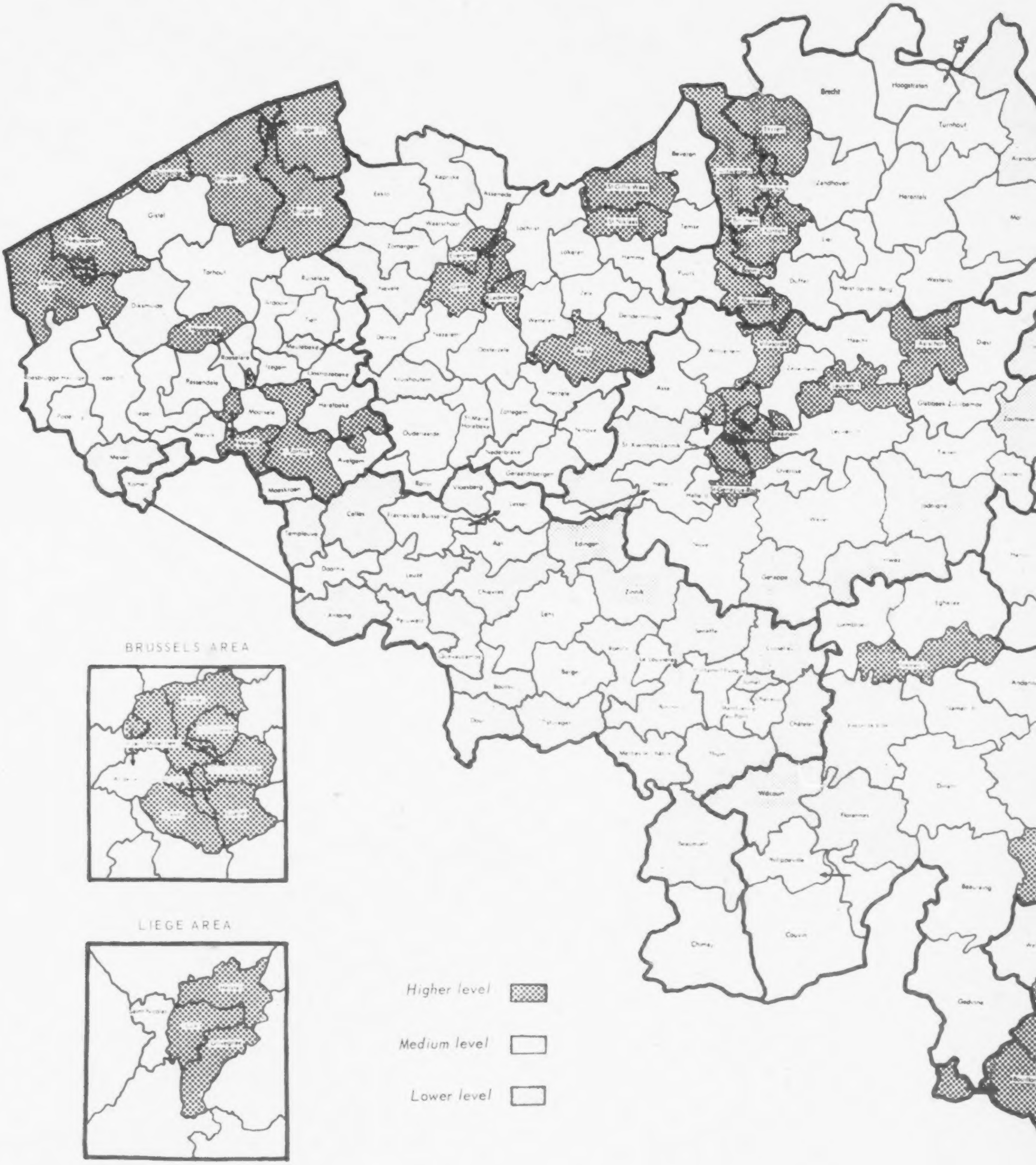
ap 1

GHER EDUCATION


Brecht
Hoogstraten
Turnhout
Arendonk
Zandhoven
Herentals
Mol
Neerpelt
Lier
Heist-op-den-Berg
Westerlo
Beringen
Peer
Bree
Maaseik
Duffel
Haacht
Aarschot
Herk-de-Stad
Hasselt
Genk
Mechelen-aan-de-Maas
Leuven I
Glabbeek-Zuurbemde
Zoutleeuw
Bilzen
Leuven II
Tienen
St-Truiden
Borgloon
Tongeren
Landen
Overijse
Jodoigne
Fexhe-Slins
Sint-Martens-Voeren
Aubel
Dalhem
Wavre
Waremme
Hollogne-aux-Pierres
Herve
Eupen
Perwez
Hannut
Jehay-Bodegnée
Fléron
Dison
Limbourg
Seraing
Verviers
Eghezée
Gembloux
Huy
Louveigne
Spa
Namur I
Nandrin
Malmédy
Andenne
Ferrières
Fosses-la-Ville
Namur II
Stavelot
Châtelet
Durbuy
Ciney
Erezée
Saint-Vith
Dinant
Vielsalm
Florennes
Marche-en-Famenne
Houffalize
Rochefort
La Roche-en-Ardenne
Nassogne
Beauraing
Bastogne
Couvin
Wellin
Saint-Hubert
Sibret
Gedinne
Paliseul
Neufchâteau
Fauvillers
Bouillon
Arlon
Florenville
Etalle
Messancy
Virton
ucation

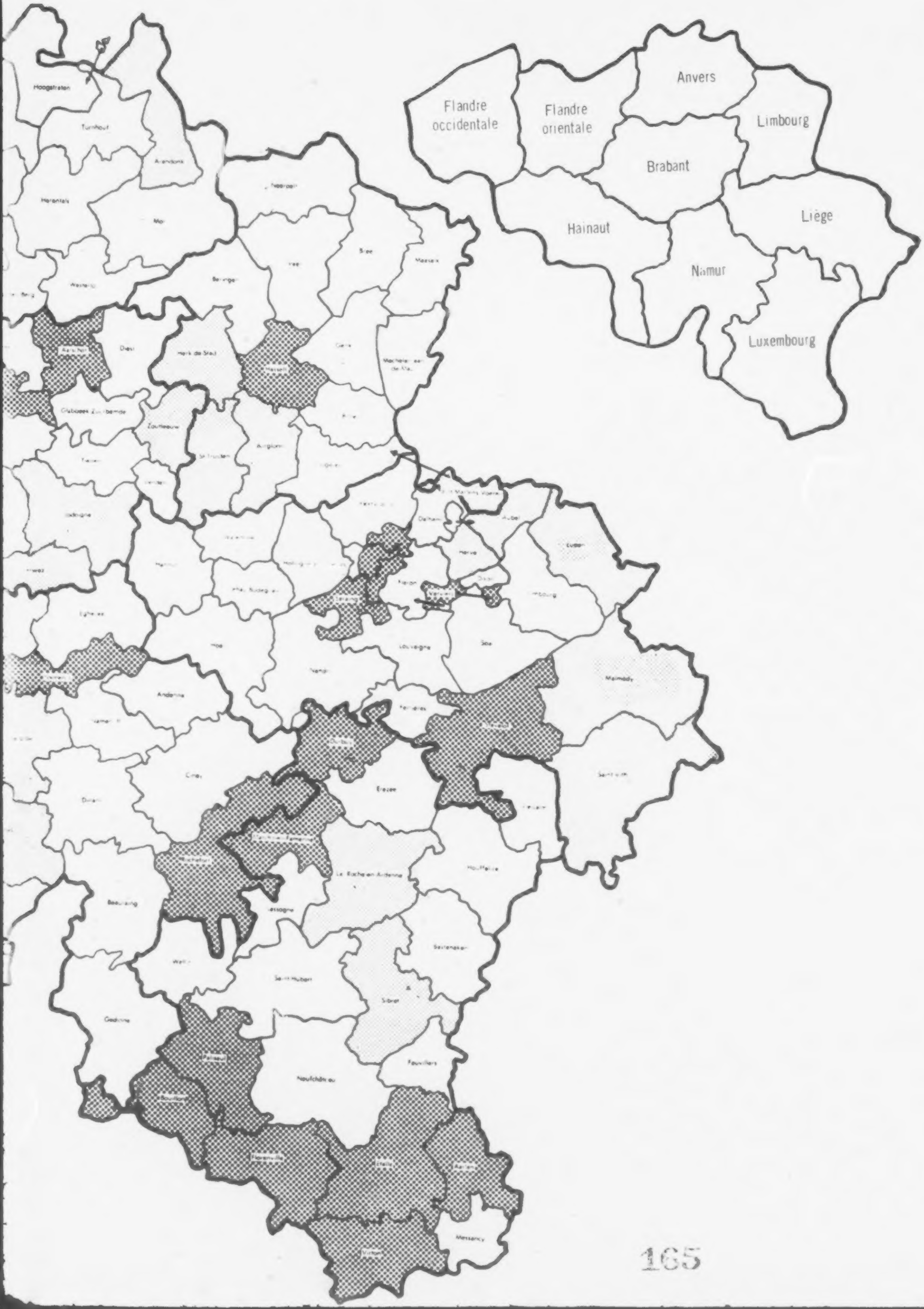
Map 2

REGIONS BY LEVEL OF INTELLIGENCE


BRUSSELS AREA
LIEGE AREA
Higher level
Medium level
Lower level

ap 2

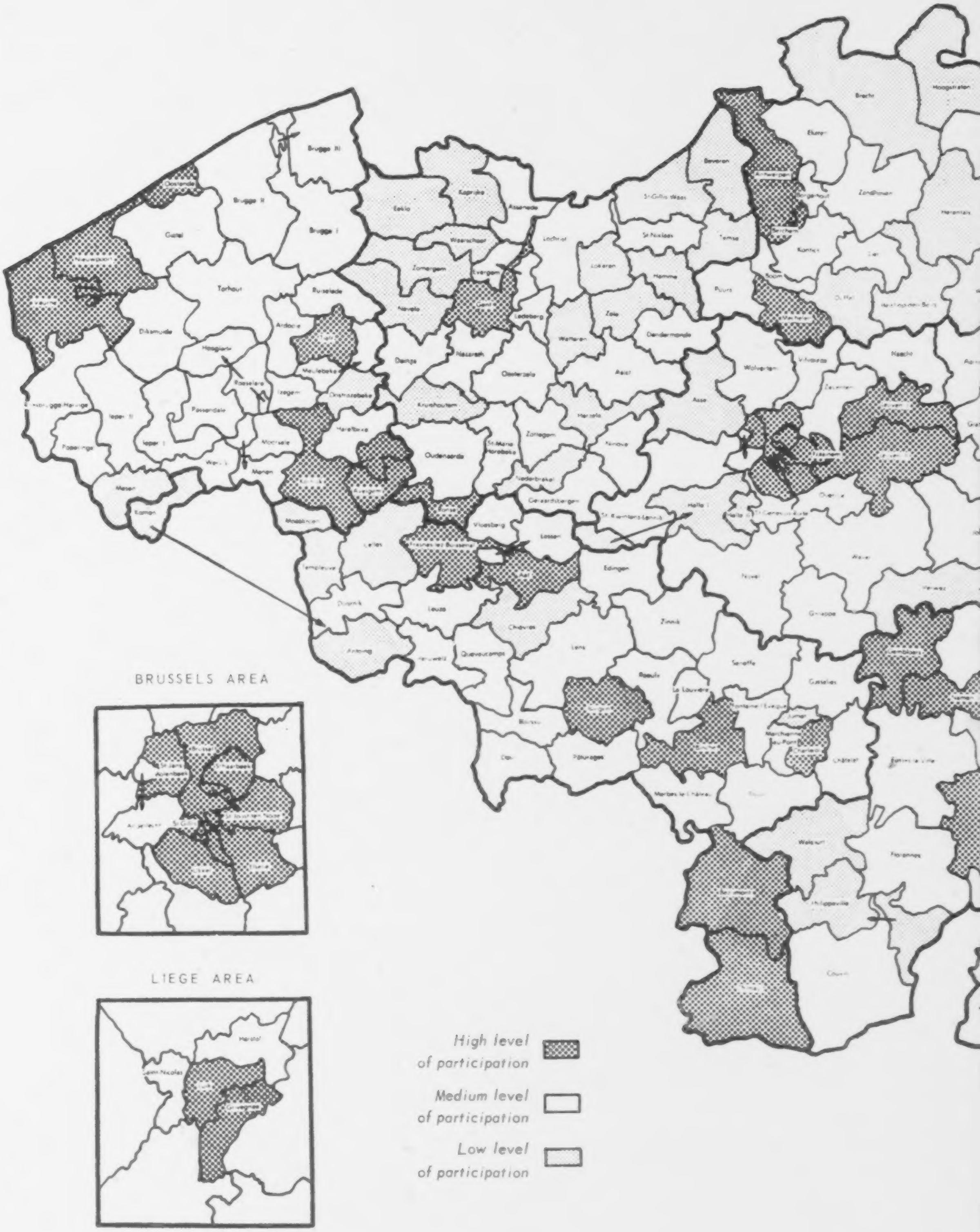
L OF INTELLIGENCE



Flandre occidentale
Flandre orientale
Anvers
Limbourg
Brabant
Hainaut
Namur
Liège
Luxembourg
Hoogstraten
Turnhout
Herentals
Mol
Diest
Herk-de-Stad
Hasselt
Zoutleeuw
Sint-Truiden
Landen
Jodoigne
Eghezée
Huy
Andenne
Nandrin
Louveigne
Spa
Herve
Aubel
Dalhem
Fléron
Limbourg
Eupen
Malmédy
Stavelot
Ferrières
Durbuy
Erezée
Ciney
Dinant
Rochefort
Vielsalm
Sankt-Vith
Houffalize
La Roche-en-Ardenne
Nassogne
Beauraing
Wellin
Saint-Hubert
Bastogne
Sibret
Gedinne
Paliseul
Bouillon
Neufchâteau
Fauvillers
Florenville
Etalle
Arlon
Virton
Messancy

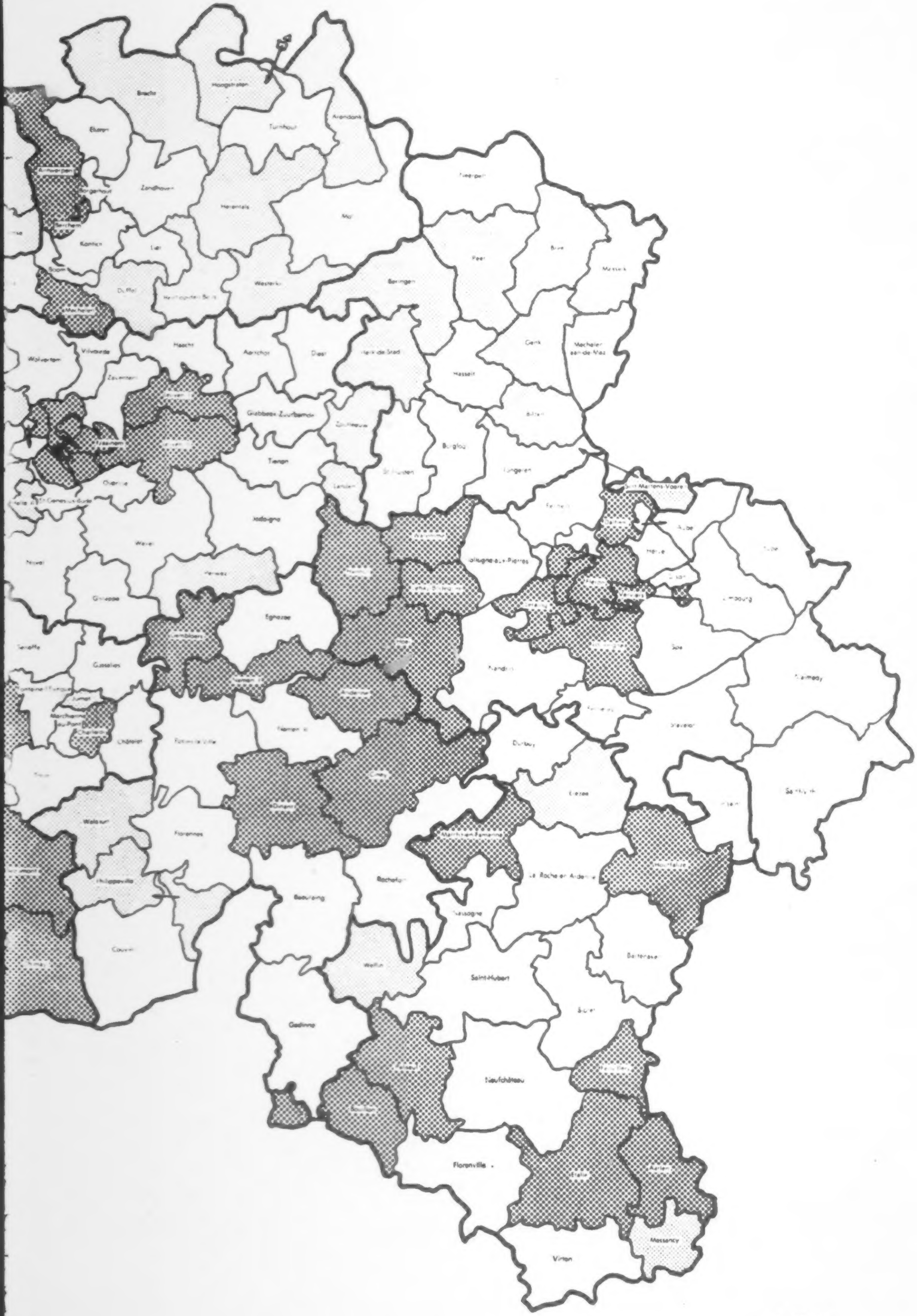
Map 3

REGIONS BY LEVEL OF HIGHER EDUCATION ENR


BRUSSELS AREA
LIEGE AREA
High level of participation
Medium level of participation
Low level of participation

Map 3

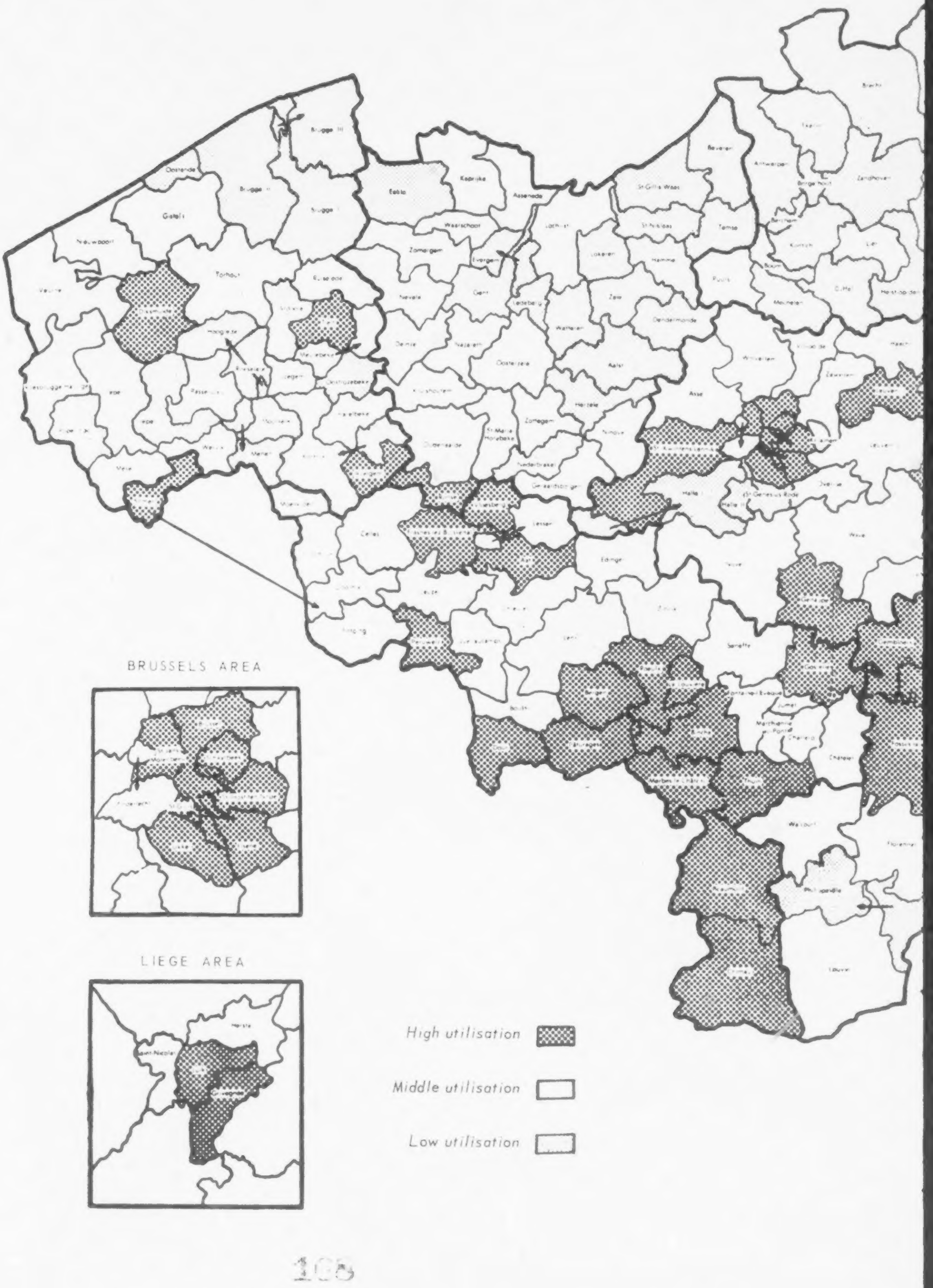
OF HIGHER EDUCATION ENROLMENT RATIOS



Brecht
Hoogstraten
Turnhout
Arendonk
Ekeren
Antwerpen
Borgerhout
Zandhoven
Herentals
Mol
Berchem
Kontich
Lier
Boom
Duffel
Heist-op-den-Berg
Westerlo
Mechelen
Beringen
Neerpelt
Peer
Bree
Maaseik
Genk
Mechelen aan-de-Maas
Hasselt
Herk-de-Stad
Diest
Aarschot
Haacht
Vilvoorde
Wolvertem
Zaventem
Glabbeek-Zuurbemde
Zoutleeuw
St.-Truiden
Borgloon
Tongeren
Bilzen
Tienen
Landen
Overijse
Jodoigne
Wavre
Perwez
Nivel
Genappe
Sint-Martens-Voeren
Aubel
Herve
Dison
Verviers
Limbourg
Eupen
Hollogne-aux-Pierres
Eghezée
Nandrin
Spa
Malmedy
Stavelot
Durbuy
Erezée
Vielsalm
Saint-Vith
Houffalize
Seneffe
Gosselies
Fontaine-l'Evêque
Jumet
Marchienne-au-Pont
Charleroi
Châtelet
Fosses-la-Ville
Walcourt
Florennes
Philippeville
Couvin
Beauraing
Rochefort
Marche-en-Famenne
La Roche-en-Ardenne
Nassogne
Wellin
Saint-Hubert
Bastogne
Gedinne
Neufchâteau
Florenville
Etalle
Arlon
Messancy
Virton

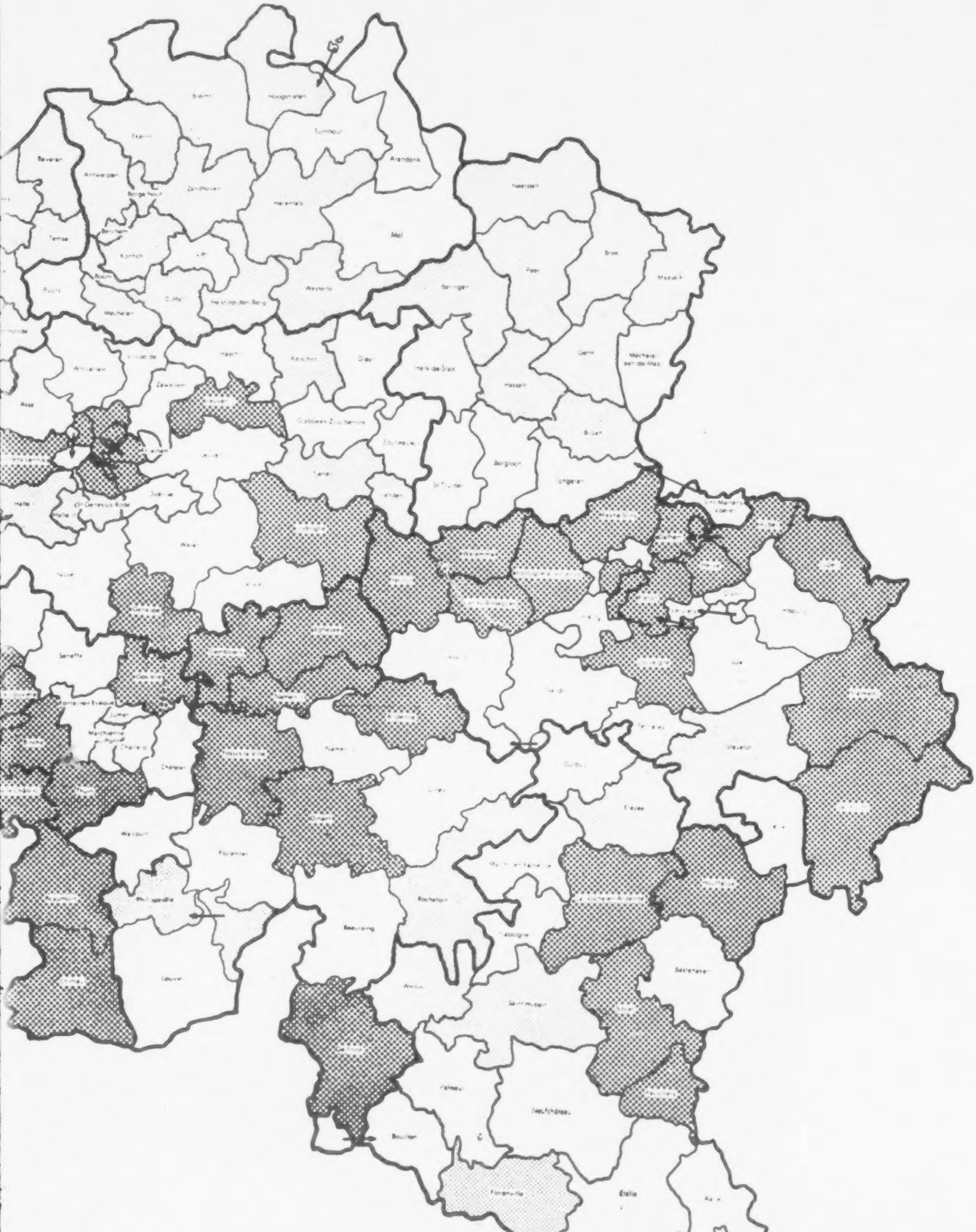
Map 4

EFFECTIVE UTILISATION OF INTELLECTUAL APTITUDE IN THE UN


BRUSSELS AREA
LIEGE AREA
High utilisation ▨
Middle utilisation ☐
Low utilisation ☐

Map 4

TUAL APTITUDE IN THE UNIVERSITY SYSTEM OF HIGHER EDUCATION


Hoogstraten
Turnhout
Arendonk
Antwerpen
Zandhoven
Herentals
Mol
Neerpelt
Bree
Maaseik
Peer
Beringen
Westerlo
Heist-op-den-Berg
Mechelen
Temse
Puurs
Boom
Kontich
Lier
Aarschot
Diest
Genk
Hasselt
Bilzen
Borgloon
Tongeren
St-Truiden
Tienen
Landen
Halle
St-Genesius-Rode
Wavre
Seneffe
Charleroi
Chatelet
Namur
Durbuy
Erezée
Stavelot
Walcourt
Florennes
Philippeville
Couvin
Beauraing
Rochefort
Bastogne
Saint-Hubert
Wellin
Paliseul
Neufchâteau
Bouillon
Florenville
Etalle
Arlon
Messancy
Virton

Uccle, the figures being more than double those for the canton of Ghent, the Flemish canton with the highest graduate density. These three cantons also show the highest university enrolment. In the other cantons of the Brussels area, with the exception of Anderlecht, utilisation of intelligence potential in university education may be regarded as optimum (see map 4).

By optimum utilisation we mean that university enrolment in the canton is well above the level which the intelligence potential would lead us to expect.

We also find high intelligence averages in the outlying communes forming the cantons of Kraainem and Rhode-St.Genèse (see map 2). In this last canton utilisation is only average (see map 4).

The important educational centre of Louvain is characterised by a high intelligence average (map 2) combined with optimum enrolment (map 4).

The whole test-region of Hageland shows a very low level of university enrolment (map 3). Although the canton of Aarschot seems to have a large untapped reserve of intelligence (map 4). The same applies to the Hal area and the cantons of Landen and Tirlemont (map 4).

In the southern part of the District of Nivelles, the cantons of Genappe and Jodoigne show low intelligence averages combined with optimum university enrolment (maps 2, 3 and 4).

Province of Antwerp

The highest intelligence averages in the Flemish part of the country are recorded in the cantons forming the Antwerp district. Contrary to the three Brussels cantons mentioned above, where similar intelligence levels were noted, university enrolment here is considerably lower. The same situation is found in the cantons of Kontich, Ekeren and Boom surrounding the Antwerp area, viz. high intelligence with inadequate utilisation at university level. Considering the very dense population of this vast area, we may say that a large reserve of potential students do not go on to the university, and this represents an enormous loss of intellectual capital.

This disproportion also occurs in the canton of Malines, but is less pronounced.

The same disproportion between intelligence potential and university enrolment is also found in the other cantons of the District of Antwerp, in the Duffel and Heist-op-den-Berg cantons in the District of Malines, and in the western part of the District of Turnhout.

Province of Liège

The highest intelligence levels in the province of Liège are in the Liège town area (with the exception of the canton of St.Nicolas) and are exactly the same as those of the Ghent district. In the Liège area, however, university enrolment is much higher.

The semi-industrial canton of Verviers and the agricultural canton of Stavelot also show high intelligence averages; in the latter canton however the spread of university graduates is not very even. Low intelligence levels are found in the cantons of Herve, Aubel, Zupen, Malmédy and St. Vith, which form the eastern part of the province. The available intelligence potential does however seem to have been fully exploited.

No low levels of participation are found in this province.

East Flanders

In the district of Ghent and the cantons of St.Nicolas and Alost where there is considerable industrial expansion, intelligence levels are the highest in the province. Despite the proximity of a university, there is still a large untapped reserve of potential students. The high intelligence average recorded in the little agricultural canton of St.Gillis-Waas is remarkable. Owing to the underdeveloped social and economic structure of this Polders canton, participation in university education is among the lowest in the province (level 2).

Of the regions where there is a striking disparity between the intelligence potential and university enrolment, we should mention particularly Eeklo in Meetjesland, the Waas district, the region of the Dendre and the region of Wetteren.

West Flanders

In West Flanders, the highest intelligence levels are found in the coastal cantons; only in the western part of the coast, chiefly in the canton of Furnes, however, does intelligence reach the optimum level for a corresponding university enrolment. The canton of Courtrai, which is the most highly industrialised region of West Flanders, also has a high level of intelligence, but university enrolment does not yet correspond to the canton's possibilities. The high intelligence average recorded in the frontier canton of Menin and the agricultural canton of Hooglede, neither of which is particularly industrial, is worthy of note. In both these cantons university enrolment is only average. The lowest intelligence averages for the province are in the two Westhoek cantons of Mesen and Dixmude. University enrolment indicates that utilisation is probably inadequate. There is a large untapped reserve of intelligence in the triangle Ypres-Roulers-Courtrai.

Province of Limburg

In the province of Limburg, where the cantons have a very low graduate density, only the canton of Hasselt shows high average intelligence. However, proportionately university enrolment is low there.

There seems to be a large reserve of intelligence capable of profiting from a university education in the centre and north of the province.

Province of Hainault

A remarkable number of cantons in the province of Hainault have a considerable percentage of conscripts who have had no secondary education. This has largely contributed to the low intelligence averages. In the highly industrialised cantons of Mons and Charleroi, the semi-industrial canton of Binche, the cantons of Beaumont and Chimay situated in the region between the Sambre and the Meuse, and in the more agricultural cantons of Ath and Fresnes-les-Buissenal in the north of the province, the high level of university enrolment is far above what might be expected from the average intelligence available.

There are no large, untapped reserves of intelligence anywhere in this province.

Province of Namur

In the province of Namur the highest intelligence averages are in the canton of Namur and the sparsely populated canton of Rochefort. It is only in the latter that university enrolment might be increased.

The highest enrolment rates are found in the semi-agricultural and semi-industrial cantons of Gembloux, Andenne, Ciney and Dinant. In these, and in the canton Namur I, enrolment is well above the level which the intelligence average would lead us to expect.

Only the cantons of Rochefort and Philippeville can be considered as areas which might provide more graduates.

Province of Luxemburg

In Luxemburg, which has the lowest population of the Belgian provinces, population is stationary or even decreasing in the Ardennes area; the surplus of births over deaths, which is high for a Walloon province, is more than counteracted by high migration to Brussels and the industrial regions.

In this province enrolment rate for secondary education is considerably higher than that for the Walloon provinces of Hainault and Namur.

High intelligence averages combined with high university enrolment are found in the north of the province at Marche-en-Famenne and in the south in the cantons of Virton, Arlon, Etalle, Bouillon and Paliseul. One of the highest intelligence levels in the country is in the canton of Virton, which also has the highest rate for secondary enrolment. Enrolment in higher education is mostly non-university, and that for the university is below the expected level.

University enrolment is distinctly insufficient in the cantons of Erezée in the north of the province, Wellin in the west and Florenville and Messancy in the south.

° ° °

In conclusion, let us indicate the regions where there is still a large untapped intelligence potential capable of profiting from a university education (map 4):

- the largest reserves are in the District of Antwerp, in the adjacent District of Termonde and the western part of the District of Turnhout;
- in the District of Ghent;
- in the Bruges-Eeklo region;
- in the triangle Ypres-Roulers-Courtrai;
- in the centre and north of Limburg;
- in the Hal area;
- in the cantons of Landen, Tirlemont and Aarschot;
- in the canton of Philippeville;
- in the region of Stavelot-Erezée-Rochefort-Wellin-St.Hubert;
- in the southernmost region of Belgium, in the cantons of Florenville, Virton and Messancy.

THE CREATION OF NEW UNIVERSITIES OF TECHNOLOGY IN THE NETHERLANDS

by
R. RUITER

Contents

I - Introduction
II - The regional recruitment of students by universities
III - Regional analysis of enrolment ratios
IV - The influence of opening a new university on the number of students
V - The influence of the opening of the Eindhoven university of technology; analysis of an experiment
VI - Concluding remarks

I. INTRODUCTION

Up till 1957 there existed only one university of technology (at Delft) in the Netherlands. This university could cater for a number of students which remained constant over a very long period before world war II. After the war it was generally recognised that increased industrialisation required a greater supply of engineers. Forecasts showing an increasing demand for engineers have played a decisive role in deciding the required expansion of training facilities in the field of engineering education in the Netherlands.

The expansion of training facilities could be found either in expanding the capacity of the existing university of technology or in creating new universities. Up till recently ad hoc committees and government were in favour of creating new universities. This resulted in opening a second university of technology in the Southern part of the country (Eindhoven 1957) and a third one in the Eastern part (Enschede 1964).

Especially two arguments were used to advocate decentralisation. One was based on the positive effect of a new university on the supply of engineers. These arguments pointed to the necessity of creating a fourth and even a fifth university of technology.

In 1965 the Minister of Education appointed the Committee Fourth University of Technology. This Committee has published its findings recently and instead of defining the type of the fourth university and the town where it should be situated, it advises not to create a new university. This negative advice reflects a basic change in the views on decentralisation of university education.

The Committee found that the training capacity of a university of technology is much greater than assumed by preceding committees and that the effect of a new university on the supply of engineers was negligible. The latter conclusion is based on a thorough analysis of statistical material which well deserves attention as it also can be applied to other countries.

The general conclusion which emerged from this analysis is that decentralisation of training facilities is an ineffective instrument to raise participation in university education and to achieve a redistribution of students over the faculties.

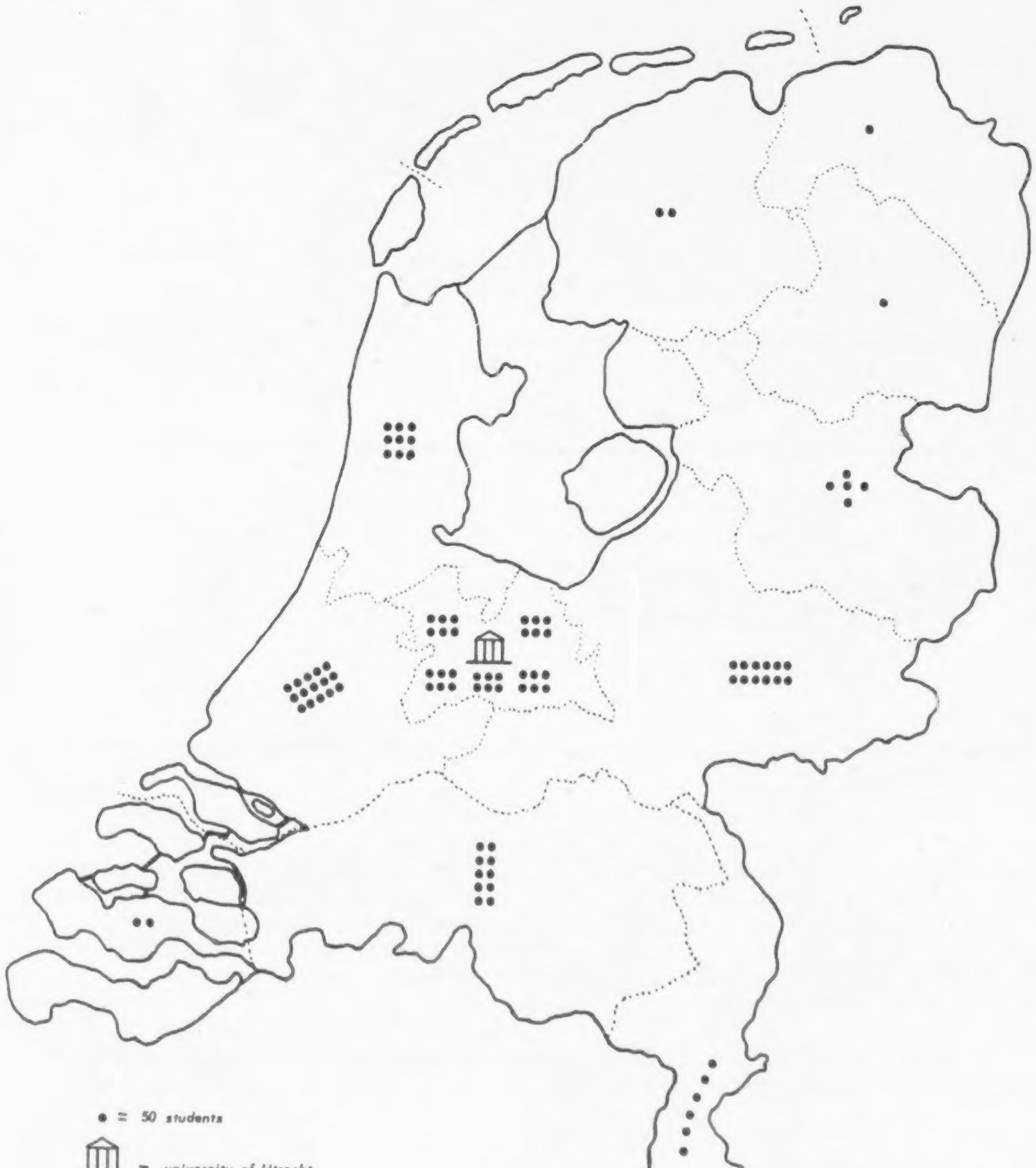
II. THE REGIONAL RECRUITMENT OF STUDENTS BY UNIVERSITIES

Universities recruit their students up to large extent from regions within short distance. This is shown for the university of Utrecht in graph 1. Graphs for other universities show similar tendencies. Especially these kinds of graphs have led to the conclusion that universities have a strong stimulating influence on participation in university education. Opening of a new university in a region far away from existing universities would therefore raise participation in university education it was argued. This would serve two purposes: a social desirable goal would be achieved through equalisation of opportunities for low participation regions and by thus tapping unused resources the supply of highly skilled personnel would be increased which was required for further economic growth.

Graph 1, however, does not permit the above stated conclusions directly. It may not show the stimulating effect of distance to universities on participation in university education, but perhaps the fact that most students wish to enroll at the nearest university. Closing of the Utrecht university might then result in a redistribution of students over the other universities with no loss of students at all; And opening of a

Graph 1

NUMBER OF STUDENTS PER PROVINCE ENROLLED AT UNIVERSITY OF UTRECHT, 1954


● = 50 students
= university of Utrecht

new university might result again in a redistribution of students with no additional students what so ever. This reasoning shows that further analysis of participation in university education is necessary, in which distance to nearest university is included as one of the explanatory variables.

III. REGIONAL ANALYSIS OF ENROLMENT RATIOS

There are large regional differences in the number of freshmen as a percentage of 18 year olds.

Table 1. NUMBER OF FRESHMEN AS A o/oo OF 18 YEAR OLDS, 1954-1956, 134 REGIONS

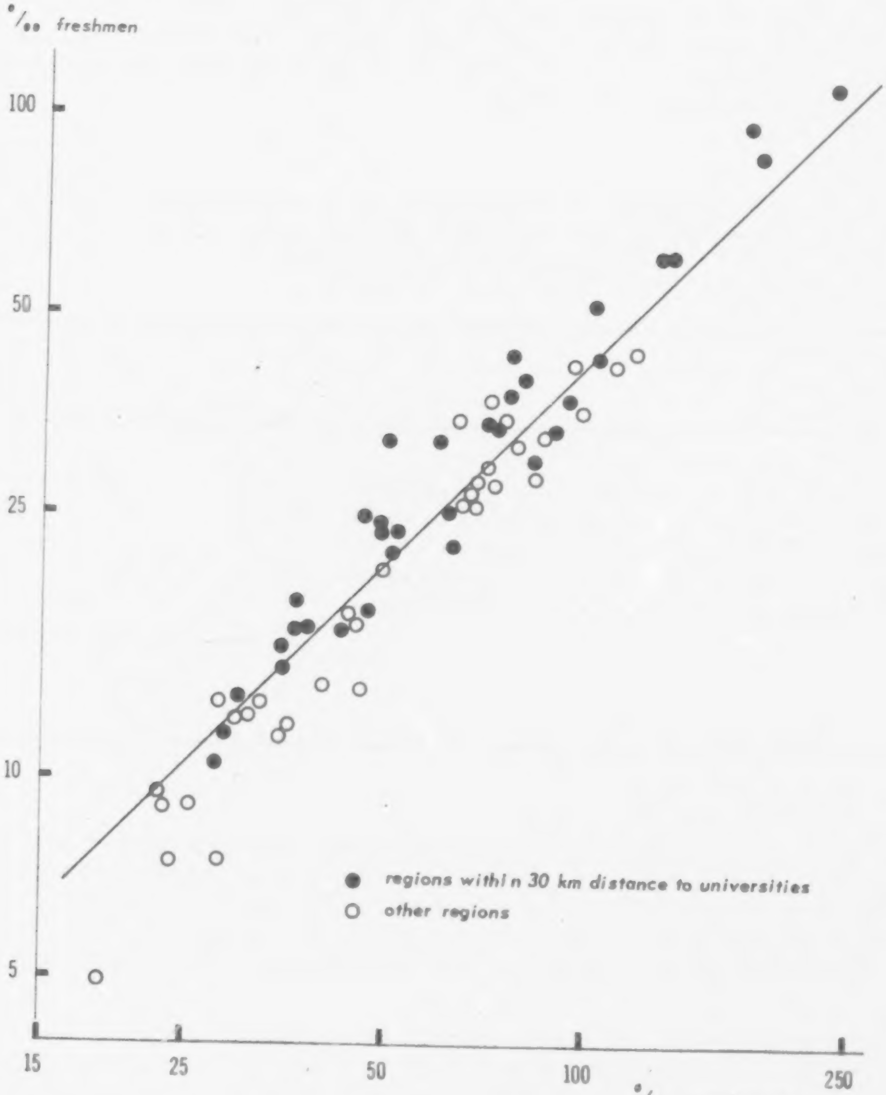
o/oo	no. of regions
0 - < 10	21
10 - < 20	51
20 - < 30	30
30 - < 40	18
40 and over	14
	134

Regions with low percentages (< 10 o/oo) are rural; those where it is more than 40 o/oo are towns or dormitory areas. As these regions also show low respectively high grammar school participation rates one is inclined to think that regional differences in the number of freshmen as a percentage of 18 year olds is up to a large extent determined by regional differences in the number of grammar school certificated leavers as a percentage of 18 year olds.

The correlation between the number of university freshmen and that of grammar school certificated leavers (both as a

Graph 2

NUMBER OF UNIVERSITY FRESHMEN AND NUMBER OF GRAMMAR SCHOOLS CERTIFICATED LEAVERS IN ‰ OF 19 YEARS OLD, 1954-1956



percentage of 18 year olds) is shown in graph 2(1).

The correlation is very satisfactory indeed. It therefore follows that regional differences of participation in higher education can by and large be explained by differences in grammar school participation.

Not all dots representing the various regions lie on the regression line. This shows that there are also regional differences in number of freshmen as a percentage of the number of certificated school leavers.

Table 2. NUMBER OF FRESHMEN AS A PERCENTAGE OF CERTIFICATED GRAMMAR SCHOOL LEAVERS, 1954-1956, 134 REGIONS

o/o	no.
< 30	7
30 - < 40	46
40 - < 50	59
50 - < 60	18
60 and over	4
	134

---

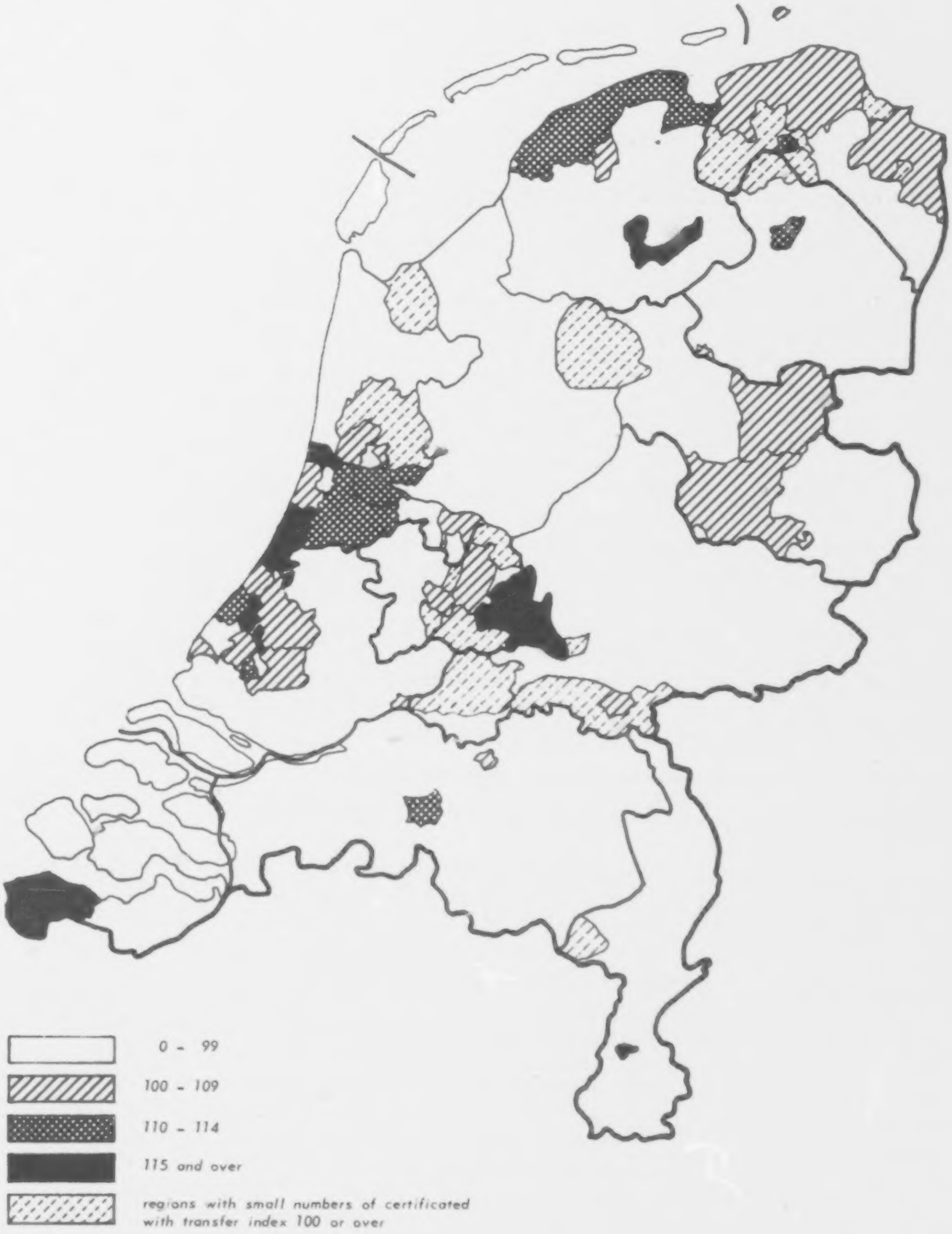
(1) The distribution of certificated leavers over sex and type of certificate varies over the regions. These categories have different transfer percentages to university education. To exclude the influence of different distributions on the total transfer percentage of regions the following procedure was adopted.

The number of various types of grammar school certificated leavers in the regions were multiplied by their corresponding national transfer percentages. The sum of these weighted leavers was divided by the national transfer percentage of all grammar school certificated. This gives a new number of grammar school leavers. The number of freshmen divided by the number of grammar school leavers thus calculated gives per region a transfer percentage exempt of the influence of regional differences in the distribution of certificated leavers over sex and types of certificate. These percentages are shown in graph 2. In order to facilitate drawing,not all regions have been presented in graph 2, but a sample.

Graph 3

NUMBER OF FRESHMEN AS A PERCENTAGE OF GRAMMAR SCHOOL CERTIFICATED LEAVERS, 1954-1956

Indices: average of whole country = 100


0 - 99
100 - 109
110 - 114
115 and over
regions with small numbers of certificated with transfer index 100 or over

Regions with high or low percentages are now quite difficult to characterise. In the 10 regions with lowest percentages one finds towns and rural areas, in those with the highest towns and dormitory areas especially in the Western part of the country.

Graph 3 shows the regional variation in these percentages.This variation is shown in indices, putting the national percentage at 100. Regions with indices below 100 have been left white. Boundaries between regions with the same indices have been erased in order to facilitate "reading" of the graph.

If one draws circles with a radius of 30 km around the universities then it turns out that nearly all regions with high percentages of freshmen to number of certificated grammar school leavers are located in the circles (1). There are still considerable differences in the percentages of the various regions inside and outside the circles. But the regions inside the circle show a transfer percentage of 46 on the average and the regions outside 39. This difference might be explained by distance to universities, but it also might be that regions within the circles are e.g. high income regions. In that case differences in transfer percentage between regions inside and outside the circles might be due to differences in per capita income, intelligence, etc. For the regions outside the circles it has been investigated by means of multiple regression analysis if there is correlation between the percentages and number of male university graduates of 45 years and older as a percentage of grammar school leavers, per capita income, number of scholarships as a percentage of all grammar school certificated leavers, rate of urbanisation and percentage of grammar school certificated leavers with high school marks, but no significant correlations were found. So the higher percentages in the regions in the neighbourhood of the universities reflect the influence of distance to universities (2).

---

(1) These regions are represented by black dots in graph 2.

(2) One might wonder why distance to universities has not been included in a multiple regression analysis which would cover all regions. The answer is that it is quite difficult to get an adequate measure of distance to universities. A distance factor, satisfactory from a theoretical point of view would have to take account of: distribution of the certificated grammar school leavers over sex and certificate as the various categories have different transfer possibilities to university education, distances to 11 universities some with a denominational character, with various numbers of faculties, some important, others not. Graph 3 shows that outside 30 km.no systematic influence of distance to universities can be found. Restriction of the analysis to the regions outside the 30 km.circles made it possible to overcome the "distance to universities" troubles.

The results of analysis of regional differences in the number of university freshmen as a percentage of 18 year olds showed that the differences are for the greater part determined by differences in number of certificated leavers of grammar schools (or grammar school participation) and for a very minor part by distance to universities.

Earlier attempts to analyse regional differences in number of students in university education as a percentage of 18-25 year olds, or number of freshmen as a percentage of 18 year olds found that the differences could be explained by total number of male university graduates of 45 years and older as a percentage of male labour force, income per capita, and intelligence. They did not take into account the number of grammar school certificates as an explanatory variable. As the transfer from grammar school certificates into university education can be regarded as constant they explained first of all grammar school participation by factors connected with university education.

IV. THE INFLUENCE OF OPENING A NEW UNIVERSITY ON THE NUMBER OF STUDENTS

On the basis of the analysis given in III it can be calculated how many additional freshmen will be enrolled as the result of opening a new university in a region not yet having one. In such a case the number of freshmen as a percentage of certificated grammar school leavers in a 30 km region around the new university would rise to 46 (the percentage prevailing in 30 km around existing universities). This simple calculation is made possible by the regional analysis which showed that distance to nearest university is the only systematic factor which causes differences in transfer percentages.

It has been calculated that according to the region in question 40-60 additional freshmen would result as a consequence of opening a new university, i.e. ± 1 % of the existing total number of freshmen. This stimulating effect is too small to be of any importance in defending decentralisation in university education.

The total number of freshmen which would seek admission to the new university would be much greater than the additional numbers. But these would otherwise go to other universities.

V. THE INFLUENCE OF THE OPENING OF THE EINDHOVEN UNIVERSITY OF TECHNOLOGY; ANALYSIS OF AN EXPERIMENT

In IV the theoretical consequences of decentralisation of university education have been calculated on the basis of an analysis of enrolment ratios.

The opening of a new technical university at Eindhoven in 1957 presents an experiment with which the results of the above mentioned analysis can be verified. In the following the effects of the opening of that university are analysed by comparing situations in 1954 (before the opening) and 1958 (one year after the opening of the Eindhoven university).

Graph 4 shows for 1954 the number of freshmen in technology as a percentage of male certificated leavers from grammar and modern grammar schools (B section) and graph 5 for 1958. The graphs show first of all a general increase in the percentages. They also show that the highest percentages are to be found in the neighbourhood of the technical universities viz. in 1954 near the technical university at Delft and in 1958 near Delft and Eindhoven. The percentages decrease with increasing distance to the universities. This shows that the opening of the technical university at Eindhoven has increased the number of freshmen as a percentage of grammar school certificated leavers. To what extent is shown in graph 6.

This graph shows for regions the relation between number of freshmen as a percentage of male certificated leavers from grammar and modern grammar schools - science section - in 1954 and the increase in this percentage between 1954 and 1958. The line in the graph is the best fit to the dots representing regions. The broken lines are drawn so that it can be expected that 90 % of the dots lie between the lines.

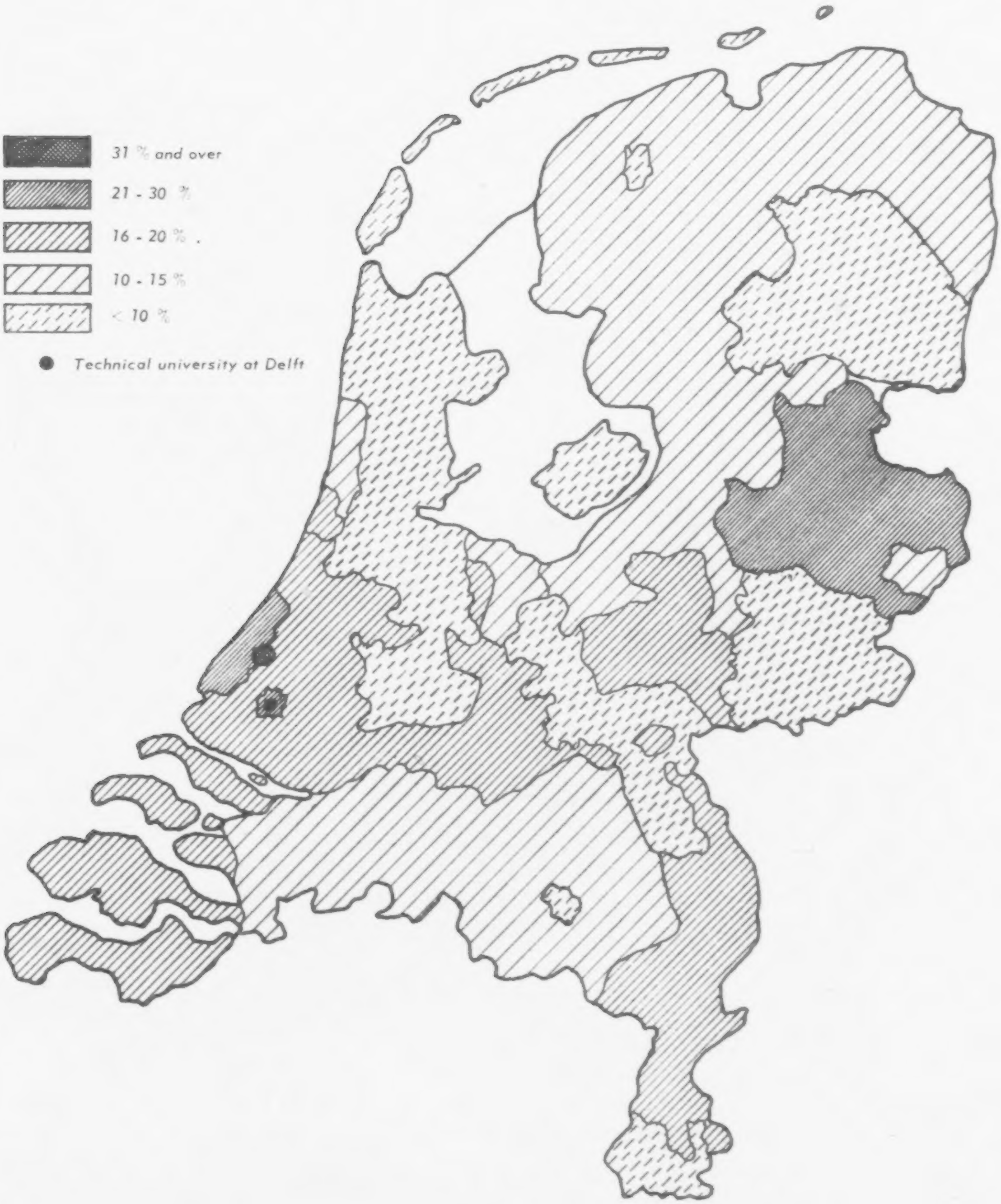
The line shows a slope, indicating that the increase in the percentages has been highest in regions where the 1954 percentages were lowest.

It can be noticed that regions within a 30 km.circle around Eindhoven show an extra increase. A small extra increase is found in regions 30-50 km.away from Eindhoven.

In the region 30 km.around Eindhoven the 1958 percentage of freshmen in technology had increased to 31. Graph 6 shows that without a technical university the percentage of 11 in 1954 would have been increased to 1.5 x 11 = 16 in 1958. It therefore follows that the percentage of technology has doubled in the Eindhoven 30 km.region as a consequence of the opening

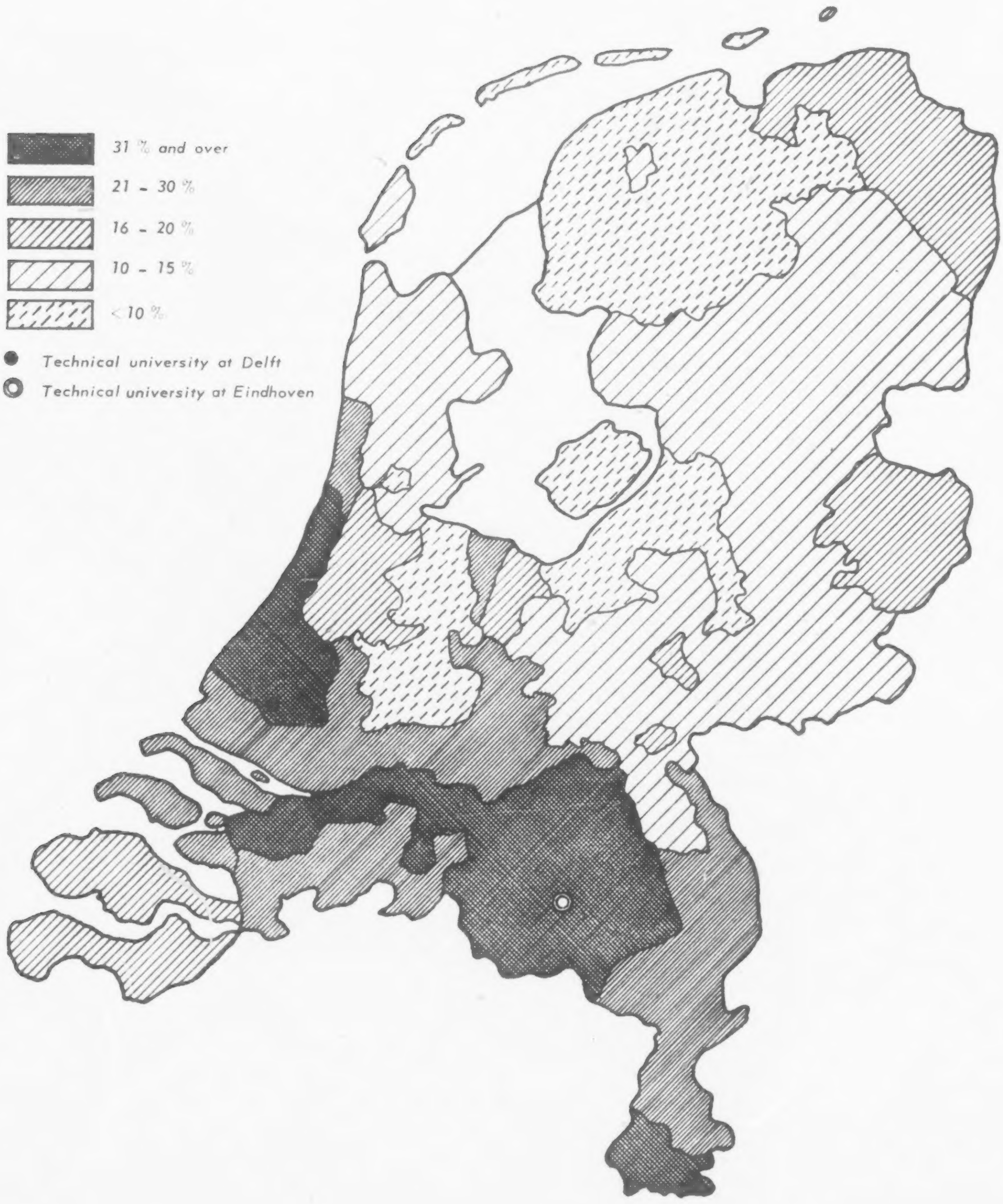
Graph 4

NUMBER OF FRESHMEN IN TECHNOLOGY AS A PERCENTAGE OF MALE CERTIFICATED LEAVERS FROM GRAMMAR AND MODERN GRAMMAR SCHOOLS (SCIENCE SECTION), 1954


31 % and over
21 - 30 %
16 - 20 %
10 - 15 %
< 10 %
Technical university at Delft

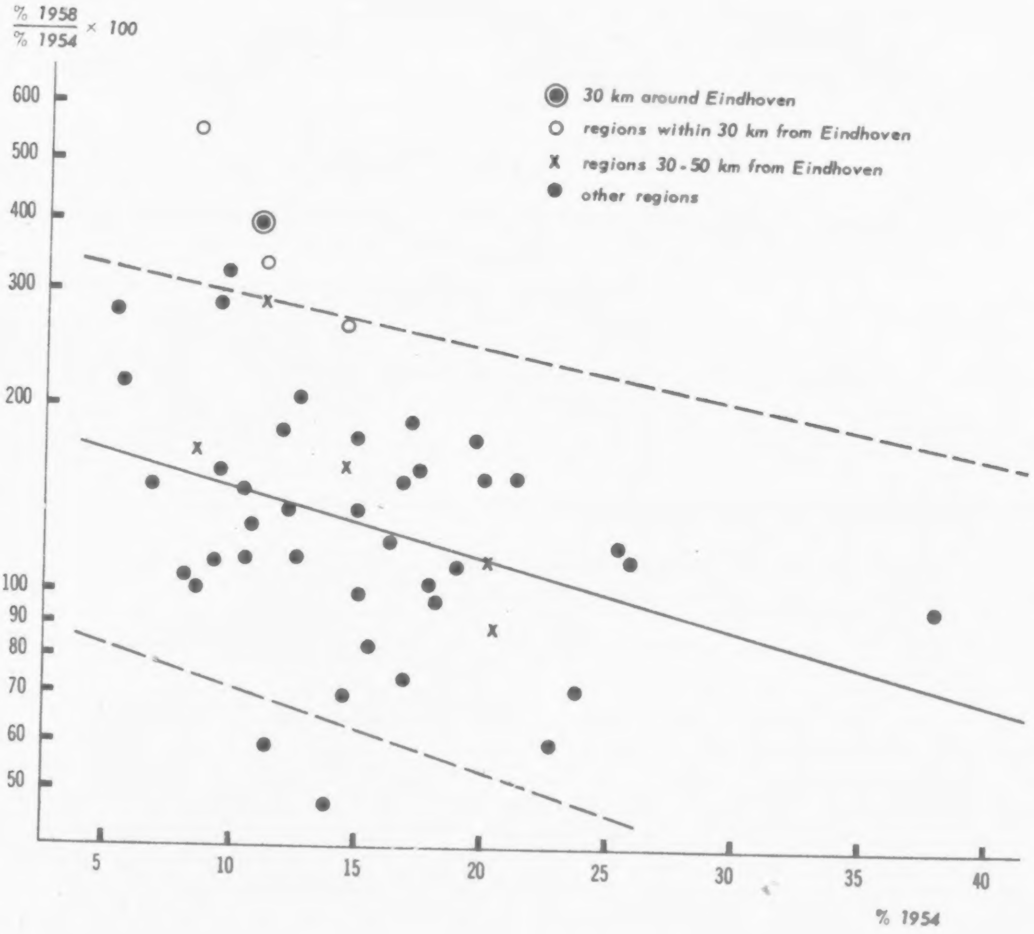
Graph 5

NUMBER OF FRESHMEN IN TECHNOLOGY AS A PERCENTAGE OF MALE CERTIFICATED LEAVERS FROM GRAMMAR AND MODERN GRAMMAR SCHOOLS (SCIENCE SECTION), 1958


31 % and over
21 - 30 %
16 - 20 %
10 - 15 %
< 10 %
Technical university at Delft
Technical university at Eindhoven

Graph 6

NUMBER OF FRESHMEN IN TECHNOLOGY
AS A PERCENTAGE OF MALE CERTIFICATED LEAVERS
FROM GRAMMAR SCHOOLS (SCIENCE SECTION), 1954 AND 1958



of the technical university. This corresponds with 40 additional freshmen in technology. These additional students in technology either are deducted from other faculties or not. In the latter case they are additional freshmen as such. Table 3 shows what has happened in the 30 km. region around Eindhoven as compared to all other regions.

Table 3. NUMBER OF MALE FRESHMEN (1) IN TECHNOLOGY AND OTHER FACULTIES AS A PERCENTAGE OF MALE CERTIFICATED LEAVERS FROM GRAMMAR AND MODERN GRAMMAR SCHOOLS - SCIENCE SECTION -

1954 and 1958, by regions

Regions	1954		1958	
	technology	other faculties	technology	other faculties
30 km. around Eindhoven	11	39	31	35
all other regions	16	36	20	40

(1) With leaving certificate from grammar and modern grammar schools science section.

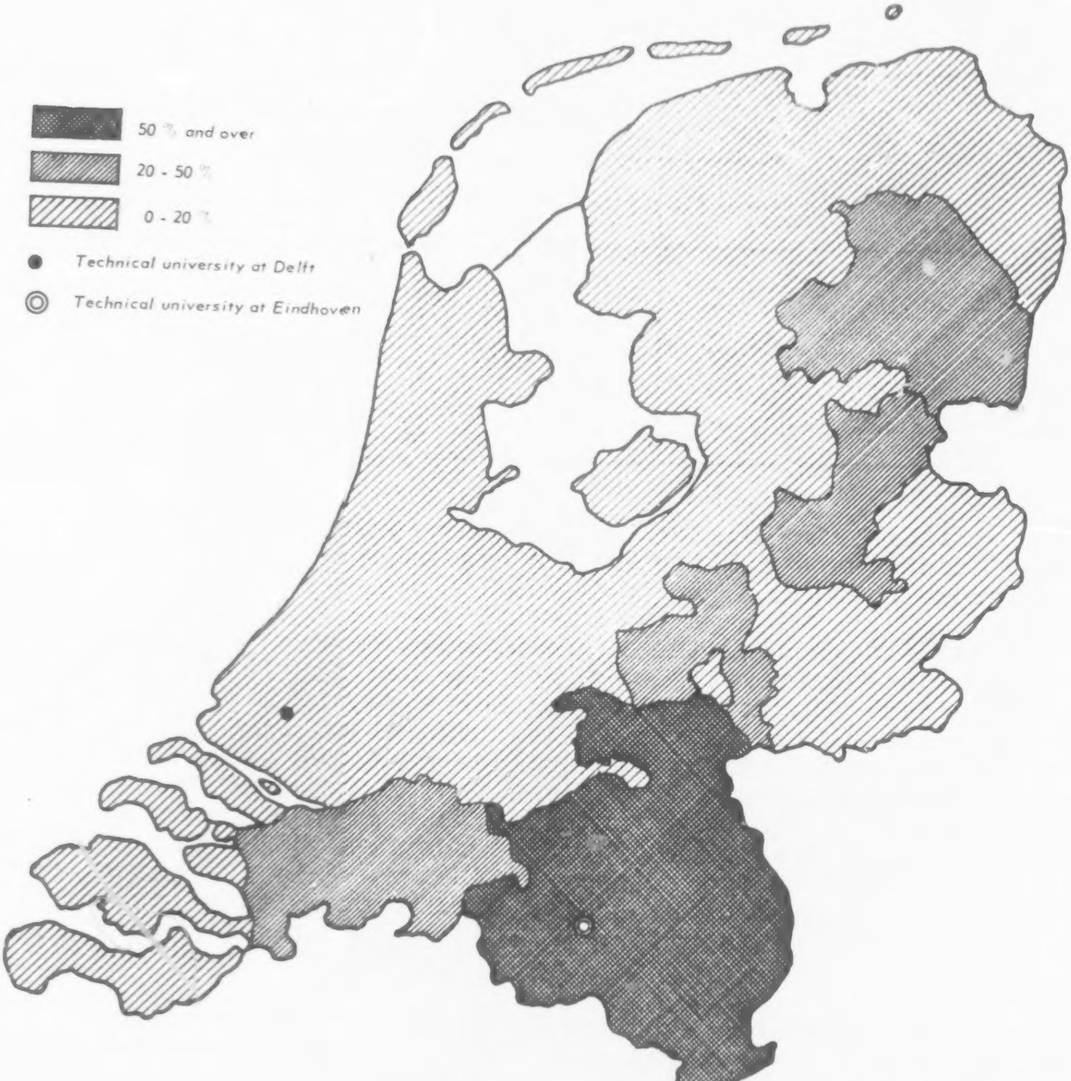
In the Eindhoven region the percentage in other faculties decreased by 4 while that in other regions increased by 4. This suggests that 8 % or 20 freshmen switched over from other faculties to that of technology in the Eindhoven region as a consequence of the opening of the technical university. It then follows that from the 40 additional freshmen in technology 20 can be regarded as additional freshmen as such, while the other 20 are deducted from other faculties.

In the regions 30-50 km from Eindhoven an increase of the percentage in technology could be found but not in the total transfer of grammar school certificated leavers (science section) to university education. So in these regions a change in choice of faculty (notably from mathematics and science to technology) only took place.

The influence of the opening of the Eindhoven university on the number of freshmen as a percentage of grammar school leavers turned out to be restricted to 30 km. around that university. That on the distribution of freshmen in technology

Graph 7

FRESHMEN AT TECHNICAL UNIVERSITY OF EINDHOVEN
AS A PERCENTAGE OF TOTAL NUMBER OF FRESHMEN IN TECHNOLOGY,
1958


50 % and over
20 - 50 %
0 - 20 %
Technical university at Delft
Technical university at Eindhoven

over both universities extended over a much greater region as is shown in graph 7.

Table 4 shows the influence of distance to both universities on the distribution of freshmen in technology over the technical universities.

Table 4. FRESHMEN AT THE EINDHOVEN UNIVERSITY AS A PERCENTAGE OF TOTAL NUMBER OF FRESHMEN IN TECHNOLOGY, IN RELATION TO DISTANCE TO DELFT AND EINDHOVEN RESPECTIVELY 1958, 134 REGIONS

Distance to Delft in km.	Distance to Eindhoven in km.				
	0- <30	30- <60	60- <90	90- <150	150 and over
0 - < 30	-	-	1	1	-
30 - < 60	-	20	7	3	-
60 - < 90	87	51	13	4	-
90 - < 150	80	75	25	8	9
150 and over	-	-	64	16	8

Increasing distance to Eindhoven is accompanied by lower percentages and increasing distance to Delft by increasing percentages.

While reading the table it must be kept in mind that the technical university at Eindhoven had (in 1958) only three technological faculties catering for about 50 % of all students of the 12 faculties of the Delft university. Taking this into account one would expect diagonal percentages of 25. As they are in fact much lower it follows that freshmen in technology prefer Delft to Eindhoven and that this preference is stronger when regions are at a greater distance from both universities. The percentages exceed 50 near Eindhoven. This indicates that freshmen in the neighbourhood of Eindhoven switched over from some technological faculties to those offered at the Eindhoven university.

The Eindhoven experiment proved by and large the results of the theoretical analysis presented in the foregoing section. They can be summed up as follows. In the region 30 km around Eindhoven the transfer to university education was raised; up to 50 km a change of faculty (especially from mathematics and science) could be found; the distribution of students over the universities (of technology) was effected almost over the whole country. This shows that effects of decreasing importance can be noticed over increasing distances. The net gain in the supply of freshmen in technology and science was found to be negligible.

VI. CONCLUDING REMARKS

After the war decentralisation of university education was advocated as a means to raise participation in university education thereby enlarging the supply of university graduates. This opinion was based on a superficial knowledge of the regional effect of universities on participation in university education. Analysis of participation ratios shows, however, that the stimulating effect of universities is negligible. These outcomes have had already a definite bearing on the findings of the Committee Fourth University which contrary to what was expected advises not to create a new university of technology. It may be assumed that views on decentralisation of university education in total will change under the pressure of hard facts shown by analysis.

STUDY OF THE PASS RATE, DROP-OUT, AND COST (1) OF UNIVERSITY EDUCATION: EXAMPLE OF A METHOD OF ANALYSIS

by

L. COETSIER
Professor of the State University of Ghent

As the pass rate in the university cannot logically be independent of the way in which the courses and examinations are organised, my report is valid only for Belgium. If we wish to study this question scientifically we cannot start from purely theoretical concepts or from unverified opinions. To make a real contribution to the development of university education we must, in each country, record precise facts, describe them, and then classify them. This will enable us to identify the various aspects of the question, after which it will be possible to define a policy and provide a choice of possible measures to improve the situation.

I. METHODS USED FOR RECORDING, DESCRIBING, AND CLASSIFYING DATA

At the State University of Ghent we have studied, together with a number of colleagues, a complete cohort of students over a period of ten years or, to be more precise, students who had enrolled at a university for the first time and who began their studies at Ghent in 1953-1954 (2).

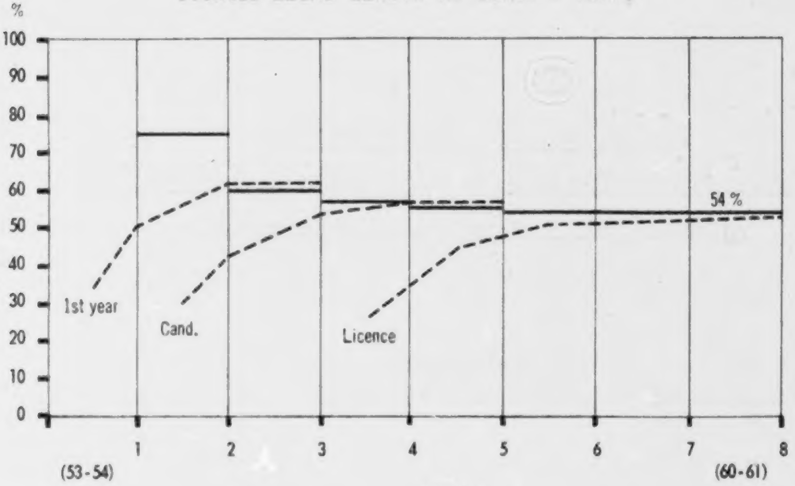
---

(1) Expressed in student-years.

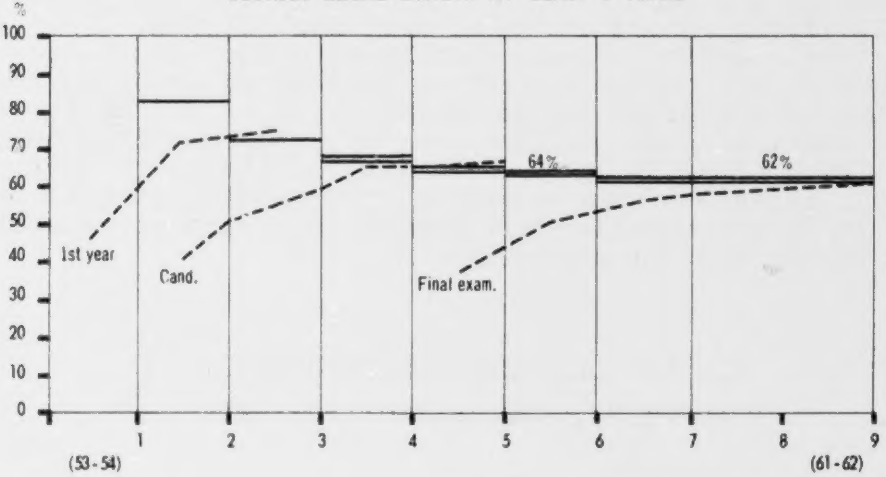
(2) COETSIER L. and BONTE A. : "Studierendement aan de Universiteit" - in Mededelingen van het Laboratorium voor Toegepaste Psychologie en de Dienst voor Studieadvies bij de R.U.G., nr. 25, 1965.

PASS RATE AND DROPOUT

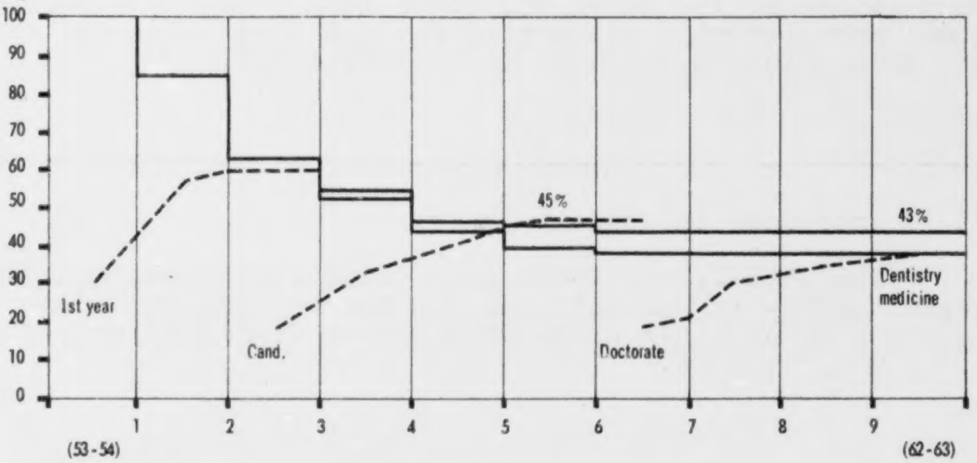
Graph 1
COURSES LEGAL LENGTH AT LEAST 4 YEARS



Graph 2
COURSES LEGAL LENGTH AT LEAST 5 YEARS



Graph 3
COURSES IN MEDICINE (7 YEARS) AND DENTISTRY (5 YEARS)



1. The most direct method of recording data is to note each year the number of students in this cohort who continue at the university, and to indicate the progress they have made. This method has enabled us to compare the trends for the different branches at the university, and to aggregate the data for all courses whose legal minimum length is the same. By using a reduction coefficient we have expressed the trend as a percentage of the number of students enrolled for the first time for the first part of a degree ("candidature").

A general account of the results obtained would be beyond the scope and aims of this report. To illustrate the method used, the following three graphs are given to show the trend in the number of students as a percentage of those who enrolled for the first time at the beginning of the 1953-1954 academic year. These aggregated data, however, mask important differences between branches of study.

- Graph 1 refers to all courses whose minimum legal length is four years, and which comprise a "candidature" and a "licence", each requiring a minimum of two years; examples are philosophy and arts, or the sciences;

- Graph 2 refers to all courses whose minimum legal length is five years, and which comprise a basic two-year "candidature" course and a more specialised three-year course i.e. law, pharmacy, applied sciences (engineering).

- Graph 3 refers to courses in medicine and odontology; these comprise a three-year "candidature" which is followed respectively by a four-year doctorate and by a two-year "licence".

These graphs are highly instructive and draw attention to a number of statistical probabilities for the pass rate, dropout and costs:

- a considerable percentage of the students repeat their first year, but eventually manage to get their degree; a student who repeats his first year twice however has very little chance of graduating.

- For the "candidature" (minimum legal length 2 years), the pass rate in the third year increases considerably, in the fourth year the increase is still significant, but the fifth year is pure loss.

- 45 per cent of those who enrol initially as medical students pass their "candidature", but only a minority do so in the minimum period of three years; the pass rate in the fourth and fifth years is still high, whereas the sixth year is wasted effort;

- 54 per cent of the students who enrol in four-year courses with an examination each year manage to obtain their final degree: 35 per cent in the minimum period of four years, and 13 per cent in five years and 4 per cent in six years ; the number of those graduating in subsequent years is thus only 2 per cent of total enrolment.

- For five-year courses with an examination each year, well over half the graduates pass their finals in the minimum time, but the pass rate continues to rise considerably up to seven years, reaching a ceiling of 62 per cent after nine years of study;

- only 43.2 per cent of the students enrolled in medicine have obtained their final degree after ten years, either as doctors of medicine (38.4 per cent) or as dentists (4.8 per cent).

- for courses with a minimum length of 4 or 5 years, drop-out is highest between the first and second year for students who leave the university without the first part of a degree; this is undoubtedly a satisfactory situation;

- for courses in medicine, on the other hand, most drop-outs occur between the second and third years; this unfavourable situation is due to a lack of balance between the programme for the first year and the over-loaded programme for the second year;

- total drop-outs for courses of at least four years show, in general, a levelling off after two years; this means that students who have failed to qualify leave the university at an age when they can easily start some other branch of study;

- for courses with five examinations it is at least three years before numbers are more or less stable; most of the drop-outs therefore spread over at least three-years;

- most of the drop-outs in medicine are spread over a period of four years; students leaving the university unqualified after four years have therefore cost the community quite a lot, and also seriously risk being unable to start in any other branch; they will also have difficulty in finding suitable employment;

- although these graphs provide a fairly clear picture of the pass and drop-out rates at the university, it is more difficult to deduce the cost of higher education as expressed by the number of years taken per degree.

The results obtained are valid of course only for the cohort studied:

- an analysis of the university career of the 1958-1959 cohort at Ghent university showed that there may be significant differences for certain groups (1);

- a comparison at Ghent university between the pass rates for those sitting for the "candidature" for the first time in the various branches in 1962-1963 and in 1964-1965 i.e. before and after a number of measures having a psychological importance for the staff, and concerning teaching aids had been passed, has shown that these measures can strongly influence results and the average time required for a degree; the present situation can never, therefore, be regarded as settled once and for all (2);

- an analysis of the results of the first years of the "candidature" in all Belgian university establishments has brought to light significant differences between pass rates;

  (i) for the same course, when comparing one university with another;

  (ii) within the same university, comparing one course with another;

  (iii) and particularly when different courses are compared for all university institutions (3);

- Graphs 4, 5, 6, 7, 8, and 9 compare, for the cohort 1948-1950 for all science courses in the Netherlands, with the 1953-1954 cohort at the university of Ghent; they show that the different methods of studying and setting examinations in such neighbouring countries as the Netherlands and Belgium result in basic differences in course pass rates, drop-out,

---

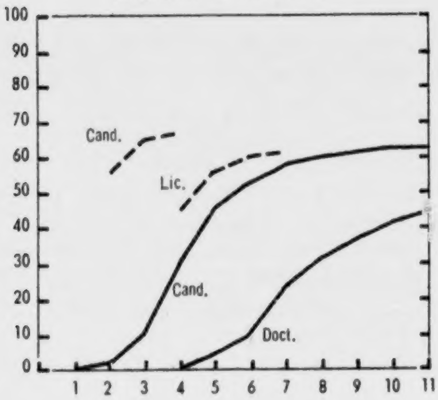
(1) COETSIER L. and BONTE A.: "Studierendement aan de Universiteit". - in Mededelingen van het Laboratorium voor Toegepaste Psychologie en de Dienst voor Studieadvies bij de R.U.G., nr. 25, 1965.

(2) This study has yet to be published.

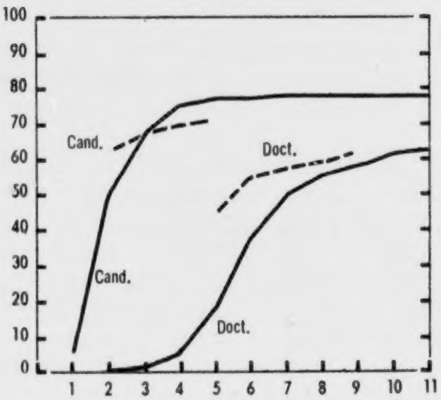
(3) COETSIER L. and PICARD H.: "Homogeniteit en Heterogeniteit van de Examenuitslagen der Eerste Kandidatuur. Interuniversitaire en Interdisciplinaire Vergelijking". - in Mededelingen van het Laboratorium voor Toegepaste Psychologie en de Dienst voor Studieadvies bij de R.U.G., nr. 22, 1964.

COMPARISON OF THE PASS RATE AT GHENT UNIVERSITY (year of 1953) WITH THAT AT UNIVERSITIES IN THE NETHERLANDS (years 1948-1950)

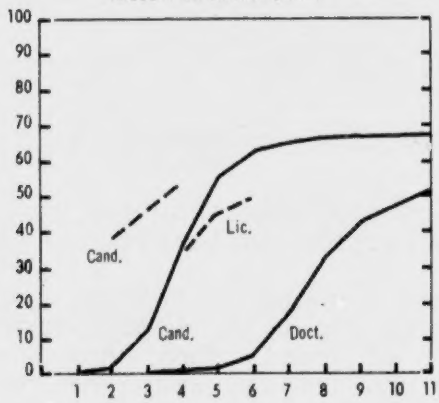
Graph 4. ARTS (Netherlands)
PHILOSOPHY AND ARTS (Ghent)



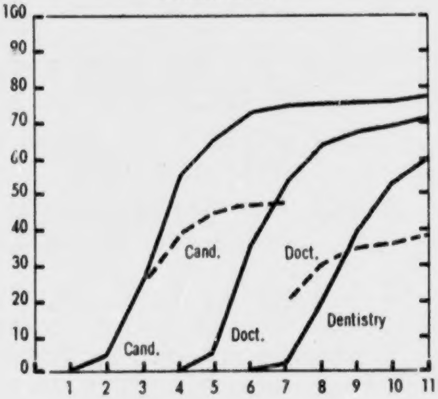
Graph 5. LAW (Netherlands)
LAW (Ghent)



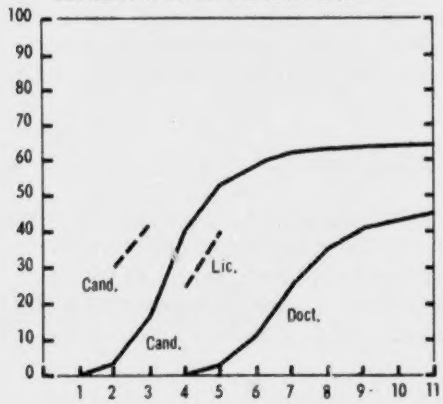
Graph 6. MATHEMATICS (Netherlands)
FACULTY OF SCIENCE (Ghent)



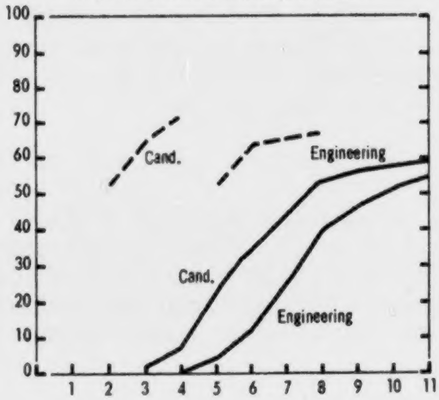
Graph 7. MEDICINE (Netherlands)
MEDICINE (Ghent)



Graph 8. ECONOMIC SCIENCES (Netherlands)
ECONOMIC AND COMMERCIAL SCIENCES (Ghent)



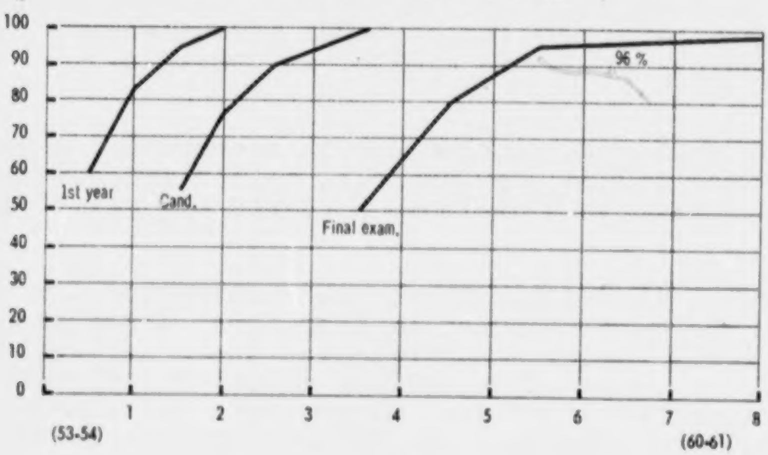
Graph 9. TECHNICAL SCIENCES (Netherlands)
FACULTY OF APPLIED SCIENCES (Ghent)



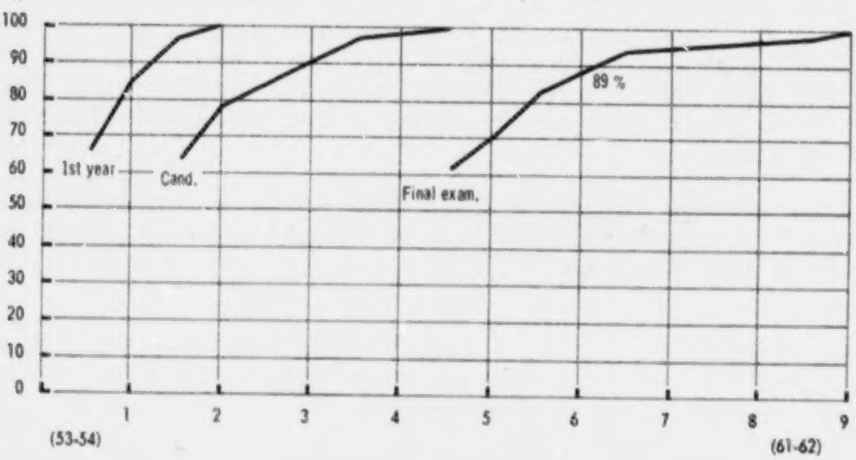
——— *Netherlands*
- - - - - - - *Ghent*

LENGTH OF COURSE AND PERCENTAGE OF GRADUATES

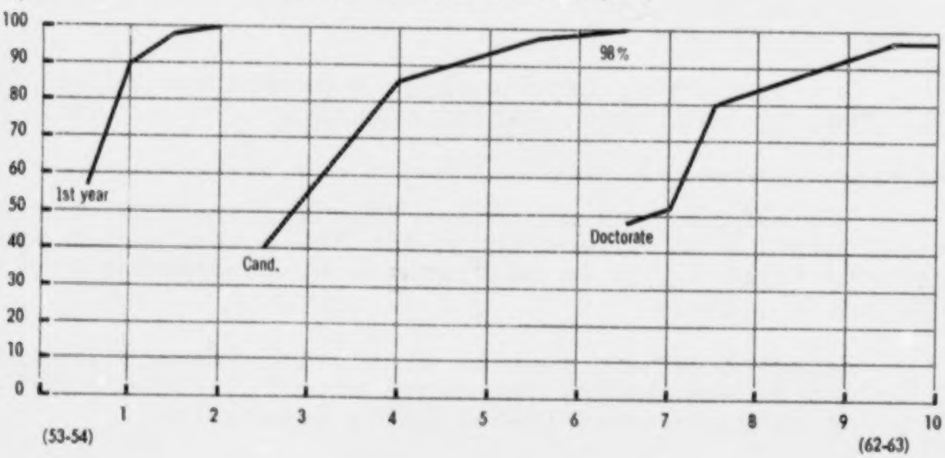
Graph 10
ALL COURSES OF AT LEAST 4 YEARS



Graph 11
ALL COURSES OF AT LEAST 5 YEARS



Graph 12
COURSES IN MEDICINE (minimum 7 years)



and costs (1) and (2). This means that it is inadvisable to extrapolate from any sort of sample. A general survey covering all the university institutions in the O.E.C.D. countries thus appears necessary using, as far as local circumstances permit, a common methodology or one as similar as possible.

2. The pass rate problem can be encompassed more closely by another method; for example, we can trace backwards the university career only of those students who get their final degree.

Graphs 10, 11 and 12 illustrate this method for the Ghent students who were freshmen in 1953-1954. These show clearly that of all students who obtained their degree, 85 to 90 per cent did not have to repeat the first year whereas the others did. Virtually 80 per cent of graduates of courses with four or five examinations pass the first part ("candidature") in two years, after three years 92 to 95 per cent have passed - 65 to 70 per cent of the students taking four-or five-year courses pass their finals in the normal time and 95 per cent after a further two years. To achieve the pass rate of 95 per cent, medical students take two years more than the minimum allowed, for the "candidature" and for the doctorate. The selection process is therefore longer for medicine than for any other branch.

This second approach does not however provide us with a picture of the cost of university education expressed in student/years per degree.

3. Tables 1, 2, 3, 4 and 5 refer to student careers for the 1953-1954 year at Ghent; they allow the average cost per degree expressed in student/years to be calculated.

Table 1 depicts the academic careers of all students in the 1953-1954 year at Ghent who did not change their course. Courses are grouped according to the minimum legal length of the complete course.

The pass rate, expressed as a percentage of graduates in relation to beginners, varies considerably according to

---

(1) COETSIER L. and BONTE A.: "Studienrendement aan de Universiteit". - in Mededelingen van het Laboratorium voor Toegepaste Psychologie en de Dienst voor Studieadvies bij de R.U.G. nr. 25, 1965.

(2) Centraal Bureau voor de Statistiek (Mededelingen): "Studieduur en -rendement van enige naoorlogse studentengeneraties (ingeschreven 1948-1950)". Zeist, 1962.

Table 1. ACADEMIC CAREERS OF ALL STUDENTS WHO DID NOT CHANGE THEIR COURSE

Course	Student/years (S/Y)										Total S/Y	Number of graduates	Percentage pass rate	Average time per degree in S/Y
	1a	2a	3a	4a	5a	6a	7a	8a	9a	10a				
Philosophy and arts	108	82	72	71	24	10	6	-	-	-	373	66	61.1	5.65
History of art and archaeology..	12	11	11	11	4	1	1	-	-	-	51	11	91.7	4.64
Education and vocational guidance	19	17	15	15	5	3	1	-	-	-	76	13	68.4	5.85
Political and social sciences ..	23	17	12	11	3	2	1	1	-	-	69	11	47.8	6.27
Economic sciences	63	44	31	30	13	1	1	-	-	-	183	26	41.3	7.04
Sciences	121	88	67	66	22	6	-	-	-	-	370	62	51.2	5.97
Physical education	23	19	13	8	2	-	-	-	-	-	65	7	30.4	9.29
TOTAL COURSES WITH 4 EXAMINATIONS	369	278	221	212	73	23	10	1	-	-	1,187	196	53.12	6.06
Law(1)	92	80	70	64	60	16	6	4	3	-	395	59	64.13	6.69
Applied Sciences	81	67	61	60	58	16	4	1	-	-	348	55	67.9	6.33
Pharmacy	40	30	24	20	19	10	4	1	1	-	149	17	42.5	8.76
TOTAL COURSES WITH 5 EXAMINATIONS	213	177	155	144	137	42	14	6	4	-	892	131	61.50	6.81
VETERINARY MEDICINE (6 EXAMINATIONS)	28	21	17	14	14	14	13	2	1	-	114	13	46.4	8.77
MEDICINE (7 EXAMINATIONS)(2) ...	117	98	71	60	51	49	48	23	10	3	530	48	41.03	11.04
GRAND TOTAL	727											388	53.4	

(1) Excluding notarial and criminology sections.

(2) Excluding dental sciences.

Table 2. ACTUAL TIME TO OBTAIN A DEGREE TAKEN BY GRADUATES WHO DID NOT CHANGE THEIR COURSE

Course	Student/Years										Number of student years	Number of grad-uates	Average period per degree in S/Y
	1y	2y	3y	4y	5y	6y	7y	8y	9y	10y			
Philosophy and arts	66	66	66	66	19	5	1	-	-	-	289	66	4.38
History of art and archaeology	11	11	11	11	4	1	1	-	-	-	50	11	4.55
Educational and vocational guidance	13	13	13	13	4	3	1	1	-	-	61	13	4.69
Political and social sciences	11	11	11	11	3	2	1	-	-	-	50	11	4.55
Economic sciences	26	26	26	26	12	1	1	-	-	-	118	26	4.54
Sciences	62	62	62	62	21	6	-	-	-	-	275	62	4.44
Physical education	7	7	7	7	2	-	-	-	-	-	30	7	4.29
TOTAL COURSES WITH 4 EXAMINATIONS	196	196	196	196	65	18	5	1	-	-	873	196	4.45
Law(1)	59	59	59	59	59	16	6	4	3	-	324	59	5.49
Applied sciences	55	55	55	55	55	14	4	1	-	-	294	55	5.35
Pharmacy	17	17	17	17	17	8	4	1	1	-	99	17	5.82
TOTAL COURSES WITH 5 EXAMINATIONS	131	131	131	131	131	38	14	6	4	-	717	131	5.47
VETERINARY MEDICINE (6 EXAMINATIONS)	13	13	13	13	13	13	3	2	1	-	84	13	6.46
MEDICINE (7 EXAMINATIONS)(2)	48	48	48	48	48	48	48	23	10	3	372	48	7.75

(1) Excluding notarial and criminology sections.

(2) Excluding dental sciences.

Table 3. STUDENT/YEARS LOST BY STUDENTS WHO REMAINED IN THE SAME COURSE BUT HAVE LEFT THE UNIVERSITY WITHOUT A DEGREE

Course of study	Student/years lost										Total	Number of students	S/Y lost per failed student	S/Y lost per degree
	1y	2y	3y	4y	5y	6y	7y	8y	9y	10y				
Philosophy and arts	42	16	6	5	5	5	5	-	-	-	84	42	2	1.25
History of art and archaeology	1	-	-	-	-	-	-	-	-	-	1	1	1	0.09
Education and vocational guidance .	6	4	2	2	1	-	-	-	-	-	15	6	2.5	1.15
Political and social sciences	12	6	1	-	-	-	-	-	-	-	19	12	1.58	1.73
Economic sciences	37	18	5	4	1	-	-	-	-	-	65	37	1.76	2.50
Sciences	59	26	5	4	1	-	-	-	-	-	95	59	1.61	1.53
Physical education	16	12	6	1	-	-	-	-	-	-	35	16	2.19	5.00
TOTAL COURSES WITH 4 EXAMINATIONS .	173	82	25	16	8	5	5	-	-	-	314	173	1.82	1.61
Law(1)	33	21	11	5	1	-	-	-	-	-	71	33	2.15	1.20
Applied sciences	26	12	6	5	3	2	-	-	-	-	54	26	2.08	0.98
Pharmacy	23	13	7	3	2	2	-	-	-	-	50	23	2.17	2.94
TOTAL COURSES WITH 5 EXAMINATIONS .	82	46	24	13	6	4	-	-	-	-	175	82	2.13	1.34
VETERINARY MEDICINE (6 EXAMINATIONS)	15	8	4	1	1	1	-	-	-	-	30	15	2	2.31
MEDICINE (7 EXAMINATIONS)(2)	69	50	23	12	3	1	-	-	-	-	158	69	2.29	3.29

(1) Excluding notarial qualifications and criminology.

(2) Excluding dental sciences.

Table 4. STUDENTS WHO CHANGE THEIR BRANCH OF THEIR COURSE WITH A COMMON CANDIDATURE SUBJECT

Length of graduate study expressed in student/years (including the time spent in the initial course)

New Courses	Student/Years										Total S/Y	Number of graduates	Average S/Y per graduate
	1y	2y	3y	4y	5y	6y	7y	8y	9y	10y			
Philosophy and arts	2	2	2	2	2	2	-	-	-	-	12	2	6
History of art and archaeology	1	1	1	1	1	-	-	-	-	-	5	1	1
Education and vocational guidance	4	4	4	4	4	3	1	-	-	-	24	4	6
Political and social sciences	1	1	1	1	1	-	-	-	-	-	5	1	5
Economic sciences	-	-	-	-	-	-	-	-	-	-	-	-	-
Sciences	1	1	1	1	1	1	-	-	-	-	6	1	6
Physical education	1	1	1	1	1	1	1	-	-	-	7	1	7
TOTAL COURSES WITH 4 EXAMINATIONS	10	10	10	10	10	7	2	-	-	-	59	10	5.9
Law	2	2	2	2	2	2	-	-	-	-	12	2	6
Applied Sciences	-	-	-	-	-	-	-	-	-	-	-	-	-
Pharmacy	4	4	4	4	4	4	3	1	1	1	30	4	7.5
TOTAL COURSES WITH 5 EXAMINATIONS	6	6	6	6	6	6	3	1	1	1	42	6	7
VETERINARY MEDICINE (6 EXAMINATIONS)	1	1	1	1	1	1	1	1	1	-	9	1	9
MEDICINE (7 EXAMINATIONS)	5	5	5	5	5	5	5	5	4	3	47	5	9.4
PUBLIC WORKS	1	1	1	1	-	-	-	-	-	-	4	1	4
DENTAL SCIENCES	6	6	6	6	6	4	3	-	-	-	37	6	6.1
NOTARY	1	1	1	1	1	-	-	-	-	-	5	1	5
CRIMINOLOGY	2	2	2	2	-	-	-	-	-	-	8	2	4

Table 5. STUDENTS WHO CHANGE THEIR BRANCH
STUDENT/YEARS LOST AS A RESULT OF STUDENTS LEAVING THE UNIVERSITY WITHOUT A DEGREE

(including years in the new course)

Initial Course	Student/years										
	1	2	3	4	5	6	7	8	9	10	Total
Philosophy and arts	8	8	3	1	-	-	-	-	-	-	20
History of art and archaeology	-	-	-	-	-	-	-	-	-	-	-
Education and vocational guidance	1	1	-	-	-	-	-	-	-	-	2
Political and social sciences	-	-	-	-	-	-	-	-	-	-	-
Economic sciences	1	1	1	-	-	-	-	-	-	-	3
Sciences	3	3	3	-	-	-	-	-	-	-	9
Physical education	-	-	-	-	-	-	-	-	-	-	-
TOTAL COURSES WITH 4 EXAMINATIONS	13	13	7	-	-	-	-	-	-	-	34
Law	3	3	-	-	-	-	-	-	-	-	6
Applied sciences	-	-	-	-	-	-	-	-	-	-	-
Pharmacy	1	1	1	-	-	-	-	-	-	-	3
TOTAL COURSES WITH 5 EXAMINATIONS	4	4	1	-	-	-	-	-	-	-	9
VETERINARY MEDICINE (6 EXAMINATIONS)	1	1	1	-	-	-	-	-	-	-	3
MEDICINE (7 EXAMINATIONS)	12	12	10	8	3	1	-	-	-	-	46
PUBLIC WORKS	-	-	-	-	-	-	-	-	-	-	-
DENTAL SCIENCES	2	2	2	2	2	-	-	-	-	-	10
NOTARY	-	-	-	-	-	-	-	-	-	-	-
CRIMINOLOGY	-	-	-	-	-	-	-	-	-	-	-

course. The average actual length of study, expressed in student/years per degree, varies inversely to the pass rate. Thus the average pass rate for minimum 4-year courses is 53.12 per cent, and the average actual length of study per degree awarded is 6.06 student/years; for all courses with a lower pass rate, the average time taken to obtain a degree is longer, whereas the opposite is true for courses with a higher pass rate. A similar situation exists for courses lasting at least five years.

The increase in the cost in student/years per degree results from the combined effect of two factors:

- study extended beyond the minimum period to obtain a degree; this cost is not a pure loss since it shows a return;
- the attempts of those who leave the university without a degree; this cost is to a large extent pure loss.

It is essential therefore to find out the exact importance of each of these two factors.

Table 2 provides, for graduates only, an indication of the actual length of study expressed in student/years. Surprisingly this average period exceeds the legal minimum by barely one tenth, and the extra time taken is very consistent. In addition, the actual period of graduate study is quite independent of the particular branch's output expressed as a percentage of the passes. This is true for both 5-year and 4-year courses.

Table 3 shows the number of student/years lost by students who remain in the same course, but leave the university without a degree. The number of student/years lost per failed student does not vary systematically with the pass rate for the course. But if we divide the number of student/years lost as a result of failed students by the number of graduates in the course, this ratio varies inversely to the pass rate.

The main facts emerging from Tables 2 and 3 show that for courses of the same minimum legal length, the cost in student/years exceeds this length by approximately only one-tenth for graduates and is independent of the pass rate of the course. For students leaving the university without a degree, on the other hand, the cost which is pure loss is considerable and varies inversely to the pass rate.

The cost in student/years can be translated into financial costs. Clearly, where for a given year the university budget is 700 million francs, and the number of students 7,000, it would be much too rough an estimate to conclude that a student/year costs a uniform 100,000 francs. There are of course considerable differences between candidatures, licences and doctorates, and between courses. But we do not have the information needed to tackle this problem here.

II. CHARACTERISTICS OF THE PROBLEM OF THE PASS RATE, DROP-OUT, AND COSTS OF UNIVERSITY EDUCATION

The pass-rate, drop-out and costs of university education are a function of two consecutive processes:

- the selection of future university students;
- the methods of training university students.

1. The selection of future university students

The obtaining of a degree is virtually the only criterion of success for university education. Students who were freshmen at Ghent during the 1953-1954 academic year constitute a group whose average pass rate is 53.4 per cent (see Table 1). Various factors contributed to the selection of these students before they enrolled at the university:

- 63 per cent were in the top half of their class in the last year of their secondary education;
- the better pupils are usually more interested in going on to the university than the less able;
- parents, school advisers and student advisory services encourage the ablest pupils to go to the university;
- secondary schoolchildren who have not obtained their leaving certificate rarely pass a university entrance examination.

Three interdependent factors are combined here:

- the university pass rate, i.e. the percentage of students enrolled for the first time at a university who subsequently obtain a degree;
- the selection ratio, i.e. the percentage of pupils completing their secondary education who decide or are advised to go to the university;
- the validity of the combination of the variables which have played a part in selection, i.e. their power to forecast on the basis of success criteria

i.e. the acquiring of a final degree; this validity can be expressed by a multiple correlation coefficient between the forecasting variables on the one hand and the selection criterion on the other.

Since the relation between the value series of the forecasting variables and that of the selection criterion is not absolute ($R < 1$) and since some pupils do not follow the indications given by the forecasting variables, errors have been made when the decision to go or not to the university is made. Errors are made by two groups of young people:

- those who enrol at a university and would never obtain a degree,
- those who do not enrol at a university but who could, however, have graduated.

It has been shown that the first category of errors leads to drop-out whose cost can be calculated in student/years. This is not true for the second category of errors. Though just as real, the social and individual losses are much more difficult to calculate. It is because these losses are less visible that they are often ignored. In practice, the fact that a suitable person does not get to university amounts from the social point of view to a lowering of the output of university education; at the same time it is a handicap to the individual both from the point of view of developing his personality and of his socio-economic value on the labour market.

For a given validity of forecasting means, the proportional distribution of errors between the two categories depends to a large extent on the selection ratio. If, taking account of the forecasts, only a small percentage of pupils completing secondary education go on to university, the errors will mainly affect those who could have obtained a degree but did not try. If, on the contrary, a large percentage opt for the university and are accepted, failures at university will account for the greater part of the errors.

If, moreover, we stabilise the selection ratio, the drop-out rate among university students diminishes as the validity of the selection procedures increase and vice-versa.

2. Methods of training university students

Problems concerning training are not independent of pre-selection. Table 3 shows that the cost in student/years per degree is mainly due to the amount of drop-out. Suitable preparation during secondary education is of great importance. But selection continues at the university itself; costs in student-years are high for faculties where the pass rate is low or where numbers are stable only after several years.

III. THE POLICY TO FOLLOW AND THE MEASURES NEEDED TO IMPROVE THE SITUATION

A reconciling of the three notions :

- the pass rate
- the selection ratio, and
- the validity of the forecasting variables

will provide us with a correct perspective in this matter.

The pass rate of the 1953-1954 year at Ghent was 53.4 per cent, or a round figure of 50 per cent. Several studies have shown that an optimum set of forecasting variables can be established to arrive at a validity coefficient of the order of .6 to .7.

The tables of H. TAYLOR and J. RUSSELL (1) show how far the pass rate is influenced by the validity of means of selection and by the selection ratio. For example, if the pass rate of a student population is 50 per cent, the use of a selection method could increase it to the extent shown by the following examples:

---

(1) TAYLOR H. and RUSSELL J.: "The relationship of validity coefficients to the practical effectiveness of tests in selection: discussion and tables". - Journal of Applied Psychology, 1939, pp. 565-578.

Table 6

Validity	Selection ratio	Pass rate	Drop-out rate	Cand.	Accepted	Drop-out	Graduates
.00 = no selection	100	50	50	200	200	100	100
.40 = e.g. tests or school results	.80	56	44	222	178	78	100
	.50	63	37	318	159	59	100
	.30	69	31	483	145	45	100
.60	.80	59	41	212	170	70	100
	.50	70	30	286	143	43	100
	.30	79	21	422	127	27	100
.70	.80	60	40	208	166	66	100
	.50	75	25	267	134	34	100
	.30	85	15	392	118	18	100

The drop-out of students who leave university without a degree can be reduced by improving the validity of the means of selection and by applying a stricter selection ratio, but at the same time the number of errors due to the rejection of applicants who could have obtained a degree increases. There is therefore no one procedure which will be favourable in all cases. A choice must therefore be made and a flexible policy followed which can be adapted to specific circumstances.

Let us suppose that the economy of the country has a pressing need to train a growing number of engineers, whereas young people are showing little interest in becoming engineering students. In these circumstances the opportunity should be given to all candidates and it would be better to use no selection procedure, to apply a 100 selection ratio, i.e. accept all candidates, and not to lower quality by keeping the pass rate at the same level, for example, 50 per cent. However, in the long run the number of candidates can be increased, e.g. by granting special scholarships. Table 6 shows that in this case the investment made in scholarships will not be pure loss, since the cost due to drop-out (100 for 100 degrees without preselection) will fall when the increase in the number of candidates will permit selection (drop-out of 43 for 100 degrees with a validity coefficient of .6 and a selection ratio of .5). Time is too short to give a large number of examples, but we are all familiar with difficult situations and in many cases a Table such as No. 6 will show the direction in which to look for a solution. If, for example, in a course such as medicine, the number of candidates is large and the cost of study is very high, the right step would be to devise reliable selection methods and thus to limit the cost due to drop-out. But arrangements will also be needed at university level in order to increase the pass rate; counselling, periodic revisions of work, end-of-term examinations, small tutorial groups, etc.

THIRD TOPIC

FORECASTS OF MANPOWER REQUIREMENTS

RECORD OF THE DISCUSSION

1. INTRODUCTION

A further approach to educational forecasting to which increasing attention is being given in the countries represented at the symposium is via manpower needs.

The earliest manpower forecasts concentrated on certain categories of highly qualified personnel, i.e. generally the strategically important categories from the economic point of view (engineers, technicians and research personnel) or those in particularly short supply (teachers, doctors). Three examples of these partial forecasts were submitted in the course of the session: Mr. Vermot-Gauchy and Mr. Ruiter outlined the method used to forecast the demand for engineers in France and the Netherlands; Mr. Corpet referred to the experience of the French metal industries in forecasting requirements for engineers and executive staff.

But there is now a growing tendency to consider that these partial forecasts are not really meaningful unless they form part of a general system of forecasting national demand for manpower by occupation and level of qualification. Mr. Ruiter gave a critical review of the methods used by various countries in overall forecasting.

The discussions which followed the various papers concentrated mainly on the three following points:

1. basic data required for forecasting;
2. Methods and criteria used in forecasting;
3. Interpretation of forecasts with a view to formulating employment and educational policy.

2. STATISTICS REQUIRED FOR FORECASTING

All the participants agreed to take as the starting point for discussion Mr. Ruiter's outline of the various stages in the manpower forecasting procedure. It was agreed that planners should have a series of matrices to enable them to analyse changes in manpower structure over time in relation to its three main dimensions:

- branches of economic activity ;
- occupational categories;
- level and type of training.

It would be possible, moreover, with an economic input/output matrix, to derive employment forecasts from production targets. But the construction and use of such matrices raises a number of problems. Two points were considered in this connection:

1. Census figures provide the main source of overall information regarding variations in the manpower pattern concerning occupation and level of education, but a census is held only once every ten years. Moreover, a manpower breakdown for each of the above three dimensions cannot be compiled from published census figures. An occupational breakdown by branch of economic activity can usually be obtained and also breakdown of the levels and types of training for each group of occupations. But in the two countries where a three-dimensional analysis of this kind has been made (Argentina and Peru) significant differences have been found in the level of training in one and the same occupation according to the branch of activity concerned.

2. Existing occupational classifications (I.S.C.O, C.O.T.A.) are not based on a single criterion i.e. the worker's function but are a compromise between several criteria, i.e. function, level of qualification, branch of economic activity, level of education, socio-professional status, etc... This makes it more difficult to interpret the relationship between the occupational make-up of a branch of activity and its level of production or productivity.

   These three main variables (branch of activity, occupation, education) should also include a breakdown by age, sex and region. The age structure, in particular, is an essential element in calculating the annual replacement rate in each occupation and it therefore affects the number of jobs available to new graduates. Moreover, the breakdown of educational levels by age group makes it possible to infer changes in educational profiles by group of occupational categories and clearly reflects the supply pattern provided by the system of education in the past.

However, as Mr. Debeauvais emphasised, the age pyramid in an occupational group also depends on inter-occupational exchanges and the number of persons returning to active employment. It is difficult to interpret the pyramid without information on the occupational mobility of labour. Forecasting errors may be particularly significant in occupations which are rapidly changing and where the age pyramid does not reflect a historical trend. The ideal solution would be to have a double-entry table showing transfers between the various occupations from one period to another. The coefficients of transfer from one occupation to another over the forecasting period could then be inferred. In France a post-census survey by the Institut National de Statistique carried out on a representative sample at national level enabled these occupational mobility factors to be studied for the period 1959-1964 (1) and showed that they were on such a scale that they could no longer be disregarded when compiling forecasts. According to Mr. Ruiter it might be possible to consider introducing a system of individualised data for the active population or a sample of the active population. Another method already used is to include in the census questions on the economic activity and previous occupation of each individual, but this information has not been analysed as closely as might have been desirable.

Data on the current manpower situation must also be supplemented by information on population trends (forecast of potential active population) and developments in the supply of education. The latter factor affects not only the activity rate of the population, but, as will be seen below, the demand for qualified personnel.

---

(1) Mobilité Professionnelle en France: Etudes et Conjoncture: (Occupational Mobility in France: Surveys and Trends) No. 10, October, 1966.

3. CRITICAL REVIEW OF THE FORECASTING METHOD USED

Following Mr. Ruiter's statement it was agreed that forecasting methods are still too rigid and that their results need to be interpreted with caution. Particular stress was put on the following points.

1. Forecasts have hitherto been far from satisfactory. In so far as they are designed to guide educational policy any errors may have very long-term consequences.
2. There is much less certainty than before regarding the nature and quantification of the relations between production or production targets and the various categories of manpower, and between a given occupation and the level of skill required to exercise it.

a) Methods of forecasting by occupational category

Even if the data needed to construct a manpower matrix by occupation and skill level were available for one or more years, the problem is still to estimate the trend in occupational patterns in the future and this necessitates certain assumptions which may or may not be explicit regarding the factors which dictate these trends. For most occupations an attempt is made to relate manpower structure to production targets. However, for certain occupations, more particularly in the services sector, it is preferable to use other criteria, e.g. the planned or desirable level of consumption used to estimate the total demand for doctors and medical personnel. For detailed forecasts concerning a particular occupation the analysis will be more precise if using a combination of several criteria based on the range of functions exercised by personnel employed in the occupation concerned. In forecasting the number of doctors in Holland, for example, three different criteria were used. According to whether general practitioners, specialists or medical officers were concerned, forecasts were based respectively on regional analysis, the ratio of doctors to hospital beds, and the general trend in the number of civil servants.

Mr. Corpet stated that a similar method was used in France to forecast demand for engineers and executive staff in the metal industries where thirteen types of different functions were distinguished. It was noted that changes in the number of engineers and executive staff within each of these functions had occurred at different rates between 1954 and 1962, this development being connected with the increase in productivity. To accord for this a distinction was made between three categories of engineers and executive staff:

a) those directly engaged on production jobs: very sensitive to increases in productivity;

b) administrative and commercial executives; here the link with productivity seems fairly loose but there is nothing to suggest that this will always be so.

c) research staff engaged in maintenance, testing or inspection, and representing a factor in the firm's future productivity.

Analyses of this kind carried out at branch or firm level show that the relationship between the numerical trends in certain occupations and the increase in the volume of production, or other economic indicators, i.e. labour productivity, as a whole or by sector , occupational productivity coefficients, capital invested per worker, etc. is not as simple or rigid as has often been assumed. On the strength of the experience gained in forecasting the demand for engineers in the Netherlands, Mr. Ruiter emphasised how little significance these relationships often proved to have once the effect of the "time" or "dimension" factor was eliminated. Mr. Ruiter considered that the results achieved from their use in forecasting demand were no more reliable than the simple extrapolation of absolute values or "densities". However, systematic international comparisons of the occupational composition of branches of activity with similar structures would be very interesting. Even if they did not provide an optimum ratio of responsible staff to workers they might show the maximum and minimum ratios in various countries and the possibilities of substitution that exist between the various categories of occupations or of training. An analysis of the manpower structure in leading firms is also fairly useful. According to Mr. Skorov this method was widely used in the U.S.S.R. to determine the number of workers required to carry out new production programmes. However, as Mr. Grais pointed out, it is much more difficult to use this method to estimate the average occupational structure in a particular branch of activity at the end of a given period. The technological gap between leading firms and average firms in the branch of activity under review would, in fact, have to be translated into terms of years. Surveys of firms may, however, give some indication of the way technological progress tends to influence occupational structure in certain branches of activity.

Another interesting method, which was used by the Manpower Commission of the Vth French Plan, is to attempt to forecast the consequences of technological progress on future demand for workers in the various occupations or even on the emergence of new occupations. There is always a point at which technological progress in a given sector becomes sufficiently well-established to warrant the assumption that it will shortly become widespread throughout the whole branch. For example the potential effects on occupational structure of the spread of automation in industry or the use of computers in offices have been under investigation in the United States for a number of years. According to Mr. Corpet, a systematic analysis of vacancies on the labour market and regular consultation of employers' associations would undoubtedly provide a preliminary idea of foreseeable changes in the demand for various occupations over a given period.

In France the preliminary forecasts of manpower distribution prepared for the Vth Plan were based simply on the extrapolation of past trends. A sector by sector examination of the figures concerned by the employers' associations represented on the vertical commissions enabled these preliminary forecasts to be brought more closely into line with the needs of the economy. It is thought probable that this type of analysis would offer better guarantees than enquiries among employers regarding their estimates of future demand for labour in the various occupational categories. The experience of U.I.M.M. has shown that although managements are able to evaluate their overall need for personnel fairly accurately on the assumption of a given increase in production, they do not appear to have a clear idea of how this would affect the various occupations: according to Mr.Corpet, errors are made mainly in estimating requirements for highly qualified personnel.

Mr. Kint indicated that similar surveys conducted in Belgium in the metal manufacturing sector (FABRIMETAL) have led to the same conclusion, and managements are no longer being asked to make forecasts. All that is done is to record the current distribution of labour each year: by comparing the distribution over several years it is then possible to record changes in the pattern and detect future trends.

b) Forecasts by level of training

This is undoubtedly the point where current forecasting methods have proved most deficient. In the first place, the analysis of past trends yields little information concerning the level of training desirable in the various categories, secondly the sole concern at this stage in forecasting has generally been to achieve a quantitative balance. At the present time it is realised that there is a need for a more precise analysis of the content of training and the use to which skills are put.

Mr. Grais emphasised the difficulty of assessing the implications of past variations in the skill level of the various occupations. Owing to the great flexibility with which the economy adjusts to fluctuations in the supply of various types of training it is generally not possible to assess the degree to which the supply of a skill exceeds or falls short of demand. For example, a shortage of a given category of graduate does not necessarily upset the quantitative balance of employment as this may well be below the level of qualifications actually asked for. The economy will no doubt run less smoothly, and remuneration for the qualifications in short supply will be higher than for other qualifications, but these negative consequences will not be reflected in the trend of manpower structure by training level as it emerges from available time series.

It may therefore be assumed that the relationship observed in the past between occupation and level of training reflects changes in the training system (both institutional and in-service) at least as much as changes in the economy's demand for skills.

The results of the survey conducted in France in the metal industries show a similar trend. Firms consulted in 1956 and 1962 on the level of training they wished their engineers and executive staff to have, thought it desirable to employ a percentage of self-taught men (non-graduate engineers) but the figure given in 1962 was higher than in 1956 i.e. 30.5 per cent and 25.5 per cent respectively. According to Mr.Corpet, this attitude would suggest that the firms were influenced in their replies by the actual situation on the labour market. The difficulty in recruiting graduate engineers has apparently increased between 1956 and 1962 as the percentage of self-taught engineers rose from 34 per cent to 38.8 per cent during that period i.e. the reverse of what was considered desirable in 1956. This had made some people wonder whether manpower forecasts by level of skill would not be more effective if based on forecasts of the supply of workers of the various types and levels of training rather than on estimates of the economy's demand. This was eventually the method used to forecast the supply of engineers in the Netherlands once it was realised that the relationship observed between trends in the density of engineers and various economic variables was of little significance.

In any case it is generally felt that a comparison between forecasts of manpower demand by level of skill and forecasts of graduate supply will be an indispensable stage in the forecasting procedure. The characteristics of the future supply of workers are in fact already determined in the first few years of the forecasting period by the number of students already passing through the secondary and higher educational systems. Furthermore, as Mr. Vermot-Gauchy pointed out, there is bound to be a delay in adapting the educational system to the requirements of the economy. There is a very considerable lag between the time when educational reforms begin to make themselves felt on the labour market and the time when they will be able to influence manpower structures to any appreciable extent.

The absence of any strict relationship between the occupation and the level of training makes it necessary, when forecasts concern a particular occupation, to consider supply and demand for categories of trained personnel which might provide substitution. In the Netherlands for example, it is thought that demand for engineers will possibly be met from the growing number of science graduates who will be going into industry. However, possibilities of substitution depend on the orientation given to training. In France for example the syllabuses of science faculties are largely planned with an eye to the training of science teachers. On the other hand, the demand for engineers in France is not independent of the supply of senior technicians: the shortfall in the number of senior technicians trained in the past few years appears to have contributed considerably to the demand for engineer training. Is not the establishment of the Instituts Universitaires de Technologie likely to bring about a sudden reversal in the situation? At the present time about 6,000 senior technicians and 7,000 engineers complete their training every year; according to the forecasts of the Vth Plan about 12,000 engineers will graduate in 1975 but the annual number of certificated technicians will be between 70,000 and 80,000. So vast a change in the ratio of engineers to technicians will probably affect the demand characteristics for each type.

In Belgium attention is being given to the problem of the foreseeable or desirable links between occupation and level of training in connection with the revision of the initial legislation on university expansion. This problem is also being studied in other countries, particularly the Netherlands, but the discussion has shown that considerable research still needs to be done in this field before sufficiently sophisticated methods of forecasting can be developed.

According to Mr.Debeauvais, an analysis of wage profiles by level and type of education in a single occupation might lead to a closer analysis of the relationship between education and productivity at branch and firm level. A survey of this kind based on a sample of firms is at present being made in the United Kingdom (1).

Nevertheless, the conclusions which might be drawn from analyses of this kind should be interpreted with caution: several studies have shown that even the biggest firms have still not worked out a policy for the optimum utilisation of the natural and acquired abilities of their work force.

---

(1) See, in this connection, Mr. Blaug, Mr. H. Peston and A. Zidelman: the utilisation of qualified manpower in industry: in Policy Conference on Highly Qualified Manpower, O.E.C.D., 1967.

Another possible type of method would be to examine the past trend in the relationships between the training received and the function actually performed either by tracing the career profile of the workers concerned or by following up the careers of a class of graduates leaving the same year.

Here again, as we have seen above, the trend in the occupational structure reflects not only the demand of the economy but also the supply characteristics of the training system.

According to Mr. Vermot-Gauchy the solution to this problem depends on the possibility of providing a precise answer to the following three questions :

1. What is the level of training required for a specific occupation?
2. What is the present level of training of skilled personnel in the various occupations?
3. To what extent can the skills needed for the occupation be acquired on the job?

It would then be possible to obtain a more accurate idea of the upper and lower limits within which exchanges between individuals of different educational levels might be accepted, or even encouraged.

c) The step from forecasting to the formulation of one of the employment and education policies

The discussion on manpower forecasting had brought out the need to use forecasting methods which take account not only of the demand for qualified personnelfor the country's economic and social development but also of the occupational and cultural aspirations of individuals. Once the forecasts have been made and the results of the two methods have been compared the next step is to translate these results into a long-term policy allowing for the foreseeable development of the educational system and changes in the labour market. Several participants were uncertain about the best way of dealing with the divergencies which are inevitable when two forecasting methods are used simultaneously. However, as Mr. Debeauvais pointed out,it should be possible to allow for the errors of under or over-estimation which are bound to affect these forecasts: past experience of forecasting makes it advisable not to consider its results as hard facts. The predominant errors in the past 15 years have no doubt been underestimates but perhaps the remarkable economic expansion of the past few years will not be maintained indefinitely. In addition, the increase in enrolment at higher education level has been such that there is every right to be concerned about the possibility of finding posts for all those who will graduate in future.

Mr. Grais had a word to say about the consequences which underestimates and overestimates can have not only for the individual but for the community at large.

He thought an underestimate would have more serious consequences for the economy than an overestimate. For instance, a surplus of graduates would be less serious than a shortage in view of the adaptability of the economy. In the long run the supply of graduates creates its own demand and this would finally be to the advantage of the economy. Nevertheless, the example of certain underdeveloped countries where there is a permanent surplus of highly qualified personnel invalidates this assumption, as Mr. Skorov pointed out. Moreover, from the individual standpoint, overestimates are certainly more serious than underestimates. But, as Mr. Vermot-Gauchy remarked, the cost to the individual is always coupled with a social cost since the sense of frustration it arouses adversely affects his attitude to his work, and this cannot but reduce his productivity.

For Mr. Cerych the cost of a forecasting error does not necessarily depend on the scale of the under or overestimate but above all on the existence (or absence) of machinery for correcting errors. For example, the error will be less severely felt by the individual and the community if the precaution has been taken to set up a system of redeployment training and permanent refresher courses which enable the errors made by the employment or educational planner to be corrected as quickly as possible. This would be a positive way of replying to the misgivings at present expressed by certain educational planners regarding the potentially adverse consequences of "too high a level" of education. The real risk is not that an individual may receive "too much" education but that he may be badly counselled in the course of his training and be unable to correct this initial error of orientation. Conversely, underestimates might be remedied by arrangements for improving the social and professional status of workers and thus meet the doubts expressed by Mr. Arnaud in his paper which opened the discussion on structural reforms.

Another way of minimising the consequences of forecasting errors is to ensure that the courses provided by the higher educational system are not overspecialised, but this brings us back to the problems of structural reform already discussed.

Finally, educational and employment planners will have to consider the need to make the results of their forecasts "socially effective" by ensuring that the various groups directly concerned in these forecasts i.e. employers' associations, university and school authorities, associations of parents and students, etc., are actively associated in their preparation and particularly in the interpretation of their results. The likelihood that the various groups will comply with the results of the forecasts will be much greater if they are informed of these results: in this way they will be able to adapt themselves progressively to the changes considered foreseeable (in the case of the forecasts themselves) or desirable (in the case of the action to be taken).

ASSESSMENT OF DEMAND AND SUPPLY OF HIGHLY SKILLED PERSONNEL

by

R. RUITER

1. Manpower forecasts, showing the future demand for various types of personnel, have to serve many purposes. Job guidance and information services want to use the outcomes of the forecasts in order to give a sound advice to those who have to make a choice between different occupations or types of education. Educational authorities try to use them as guide lines for expansion of educational facilities or see them as a means to defend their ever increasing budget.

Economic policy-makers interested in long term economic growth show increasing interest in the outcomes of demand studies in the field of manpower. Sometimes interest in manpower studies has been politically determined. Industrialists noticing or fearing shortages of skilled (or unskilled) personnel are interested in surveys showing where they stand and are likely to go.

The interest for educational forecasts showing the future number of pupils in the various types of education, the supply of graduates, required outlays, etc., has up till now much more been restricted to educational policy-makers. Failure to take interest in supply forecasts has sometimes led to wrong investment decisions. After world war II industrialists in the Netherlands expecting a continuous flow of unskilled labour invested in the appropriate type of machinery. However as a consequence of increasing participation in secondary technical and non-technical education the stream of young unskilled workers dried up while more skilled workers came forward and changes had to be made in the type of machinery and of organisation in order to correct the original decisions. Other examples can be given to prove that it would be in the interest of employers to devote more attention to supply forecasts.

Given these varying backgrounds it is not surprising to find quite a number of different manpower forecasts and educational plans.

Typical forecasts are:

Educational forecasts	Manpower forecasts
a) for one school b) for one type of education c) for one specific region d) a national comprehensive plan	a) for one employing institution b) for one industry c) for one specific occupation or a limited number of closely related occupations (nurses, computer specialists) d) for one specific region e) a national comprehensive plan

Goals, instruments and ways of implementation of the plans based on these forecasts differ widely as can be ascertained by comparing e.g. a national comprehensive plan with that for one school or one enterprise.

Especially manpower forecasts on which national comprehensive educational plans can be based have attracted much attention lately. By means of these forecasts it would be possible to gear educational expansion to economic growth.

2. That skilled manpower is related to economic performance is an every day experience and can be demonstrated by international comparison, historical development and comparison of educational level attained and income earned by individual persons.

An international comparison is presented in the following table. In this table the socio-economic characteristics are presented of a sample of 100 countries. These 100 were arranged to income per capita and then divided in 5 groups, each comprising about 20 countries.

The table shows data of a 1960 cross-section but can be interpreted as a table showing the implications of and conditions for economic growth.

Table 1. CHARACTERISTICS OF COUNTRIES IN DIFFERENT STAGES OF ECONOMIC DEVELOPMENT, 1960 (1)

	stage				
	1	2	3	4	5
A. Economic situation					
Gross domestic product per capita (U.S. $)	61	103	197	420	1265
Energy consumption per capita (in kilogr. coal)	41	110	224	982	3255
B. Manpower					
Male active population to economic sector (%)					
Agriculture	76	63	61	41	18
Manufacturing, mining, construction	8	14	17	25	46
Services	16	23	22	34	36
	100	100	100	100	100
Male active population to status and occupation (%)					
0 professional, technical and related workers	-	2	2	5	9
1 administrative, executive and managerial workers	-	1	2	4	6
2 clerical workers	-	3	3	6	5
3 sales workers	-	6	3	8	6
4 farmers, fishermen, hunters, loggers	-	66	60	30	17
5 miners, quarrymen	-	1	1	2	1
6 workers in transport and communication	-	2	4	6	9
7-8 craftsmen, prod.-process workers	-	10	16	28	40
9 service, sport and recreation workers	-	3	5	5	4
X others	-	6	4	6	3
		100	100	100	100

---

(1) Source: statistical publications of the U.N. and its affiliated organisations. The countries included are listed in Appendix I.

Table 1 (cont.)

	stage				
	1	2	3	4	5
Percentage distribution by highest level of education completed of the population 25 years and over					
less than 1st level	-	82	80	46	17
1st level (primary)	-	14	16	44	62
2nd level(secondary)	-	3	3	8	18
3rd level (higher)	-	1	1	2	3
	100	100	100	100	100
Physicians per 100 000 of population	5	15	25	86	123
Dentists " " "	0	2	5	21	42
Midwives " " "	4	10	11	36	26
Pharmacists " " "	1	5	7	32	36
Veterinarians " "	0	1	1	8	12
Nurses " " "	15	22	28	116	350
C. Education (age group)					
Enrolment as a percentage of age-groups to types of education					
Males					
primary (5-14)	28	53	42	65	74
secondary general (15-19)	21	21	22	29	53
secondary vocational (15-19)	1	5	6	11	41
secondary total (15-19)	22	28	31	41	90
teacher training secondary (20-24)	1.0	0.7	0.8	1.0	1.1
teacher training higher (20-24)	0.2	0.5	0.3	0.4	1.7
teacher training total (20-24)	1.0	1.1	1.0	1.2	...
higher education (20-24)	2.4	3.5	2.8	7.0	11.5
Females					
primary (5-14)	16	45	35	64	74
secondary general (15-19)	5	11	13	25	53
secondary vocational (15-19)	0.3	2	3	7	33
secondary total (15-19)	5	13	18	33	81
teacher training secondary (20-24)	0.5	0.3	0.9	3	2
teacher training higher (20-24)	0.0	0.3	0.4	1	2
teacher training total (20-24)	0.6	0.7	1.0	4	3
higher education (20-24)	0.4	1.0	0.9	3	5

Table 1 (cont.)

	stage				
	1	2	3	4	5
Students in higher education to branch of study (in % of total)					
humanities	26	19	16	17	25
education	5	9	6	11	9
fine arts	-	2	3	6	2
law	8	15	18	14	7
social studies	24	18	16	13	11
natural sciences	19	13	9	8	14
engineering	5	8	12	11	14
medicine	9	13	19	16	16
agriculture	2	4	3	3	3
not specified	2	1	-	2	-
	100	100	100	100	100
Teaching staff first level as o/oo of population	120	254	308	450	473
Teaching staff second level ...	23	35	62	143	222
Teaching staff vocational education	3	11	22	52	128
Teaching staff teacher training	2	8	7	17	12
Teaching staff third level	3	12	16	40	53
Public expenditure on education as a % of national income	2.7	3.5	2.3	3.2	4.2

The table suggests that demand for highly skilled personnel (professional and technical workers, workers educated at second and third level of education, medical third level personnel) grows very fast especially in the later stages of economic growth. The table also suggests that supply of educated personnel (presented as enrolment as % of the corresponding age groups) also increases with increasing income levels. There seems to be a mechanism working by which in the long run increasing demand for skilled personnel is matched by an increasing supply of skilled personnel. The manpower planner has the delicate task to improve this mechanism in order to prevent short term shortages and surpluses. The proof has still to be given that he is able to do so.

3. Special emphasis on demand/supply studies of highly skilled personnel can be defended if due regard is given to its long gestation period and its pivotal role in economic and technological development. Nevertheless it should always be kept in mind that highly skilled personnel (e.g. university

graduates) constitutes only a small percentage of total employment, even in highly developed countries.

The following table shows for the Netherlands total labour force to highest educational level attained.

Table 2. LABOUR FORCE TO HIGHEST EDUCATIONAL LEVEL ATTAINED, 1960 (THE NETHERLANDS)

Level	%
Primary	56.1
Secondary modern	33.5
Grammar school	7.1
College	1.9
University	1.4
Total ...	100.0

Preferably forecasts of highly skilled personnel should be undertaken as part of a forecast covering all kinds of workers. If for one reason or another this does not seem possible special attention should be given to those categories which can be regarded either as competitive or as complementary.

4. The methods used for estimating the demand for highly skilled personnel are the same as those used for other categories of workers and resemble those used for forecasting the demand for investment goods or consumption goods.

For some categories who render their services directly to the public (e.g. a substantial part of medical doctors) the methods used in forecasting are more or less similar to those used to forecast the demand for consumption goods. Other categories which can be seen as production factors (e.g. engineers) should be treated as such in the forecasts. This shows that a reconnaissance of the market in which the category of personnel concerned is working should precede analysis and forecasts.

5. Sometimes only forecasts of demand are given. It should be preferred to give demand and supply forecasts simultaneously in order to get a first idea if and what instruments should be applied to make supply match demand. Forecasts showing only the increasing demand may give the false impression that additional effort of educational authorities to stimulate participation in education is required. If a supply forecast is

also made it may turn out, however, that supply tends to grow faster than demand.

6. In the field of manpower and educational forecasting a bewildering number of seemingly different methods are used. These can, however, be seen as special cases of an underlying general model. This general model is based on three important tables:

a) an economic input-output table
b) a manpower input-output table
c) an educational input-output table.

These tables are important tools to analyse systematically the three problem areas of manpower planning: economic growth, manpower requirements and educational expansion. Assuming these tables are available over a number of years and in required detail the general model can be sketched. The various approaches actually used can then be exposed rather simply, compared and evaluated by seeing what parts of the general model are used.

a) A simplified input-output table is presented below.

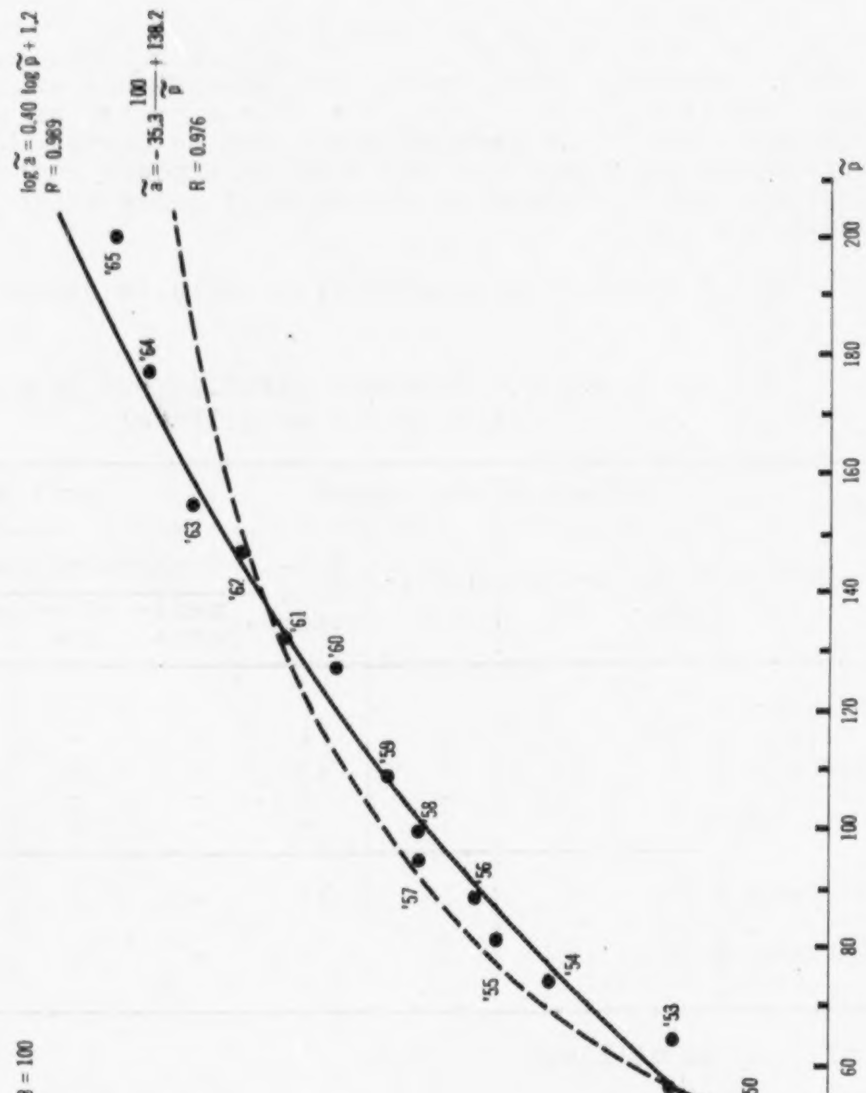
Table 3. ECONOMIC INPUT-OUTPUT TABLE
(in billions of dollars)

Inputs	Intermediate demand				Final demand			Total
	Agri-cult.	Indus-try	Servi-ces	Pri-vate constr.	Government constr.			
					medi-cine	serv-ice	educa-tion	
Agriculture	1	4	-	1	-	-	-	6
Industry	2	10	2	10	-	1	1	26
Services	-	3	-	6	-	-	-	9
Value added	3	9	7	-	-	2	4	25
Total	6	26	9	17	-	3	5	-
Employment (a)	6	9	7	-	-	1	4	27

(a) In millions.

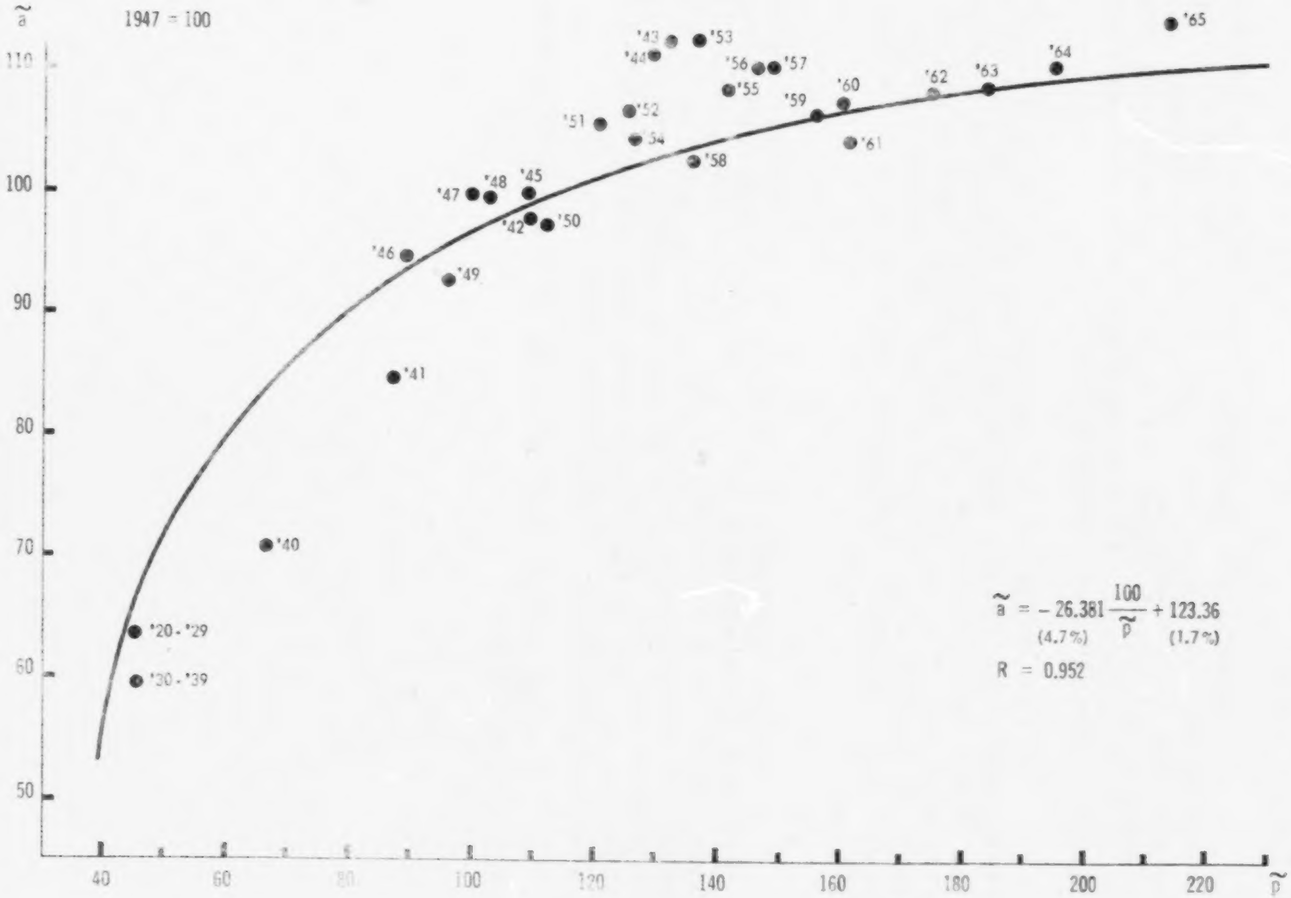
NUMBER OF WORKERS $(\tilde{a})$ AND VOLUME OF PRODUCTION $(\tilde{p})$

CHEMICAL INDUSTRY, THE NETHERLANDS



NUMBER OF WORKERS $(\tilde{a})$ AND VOLUME OF PRODUCTION $(\tilde{p})$

MANUFACTURING INDUSTRY, USA



$$\tilde{a} = -\underset{(4.7\%)}{26.381}\,\frac{100}{\tilde{p}} + \underset{(1.7\%)}{123.36}$$

$R = 0.952$

The tables show that the output of agriculture is bought by agriculture itself, industry and for private consumption. It also shows that the total production of industry requires inputs from agriculture, industry itself and the service sector.

Given the targets or forecasts for private and government consumption the required total production for every sector can be calculated. Taking into account the expected increase in labour productivity the employment per sector can be calculated for future years.

Assessment of employment per sector is mostly done by economists who then provide basic material for the manpower planner. The economist might use relations between volume of production and total number of workers as shown in the graphs. This method, however, is not applicable to the sectors "medical service" and "education".

In the table it is assumed that there is a state medical service. Future employment in this sector is assumed to be fixed by government in accordance with the goals the government has set in the medical field. And employment in the education sector can be calculated only after having fixed the targets for enrolment and pupil teacher ratios in the years to come.

b) The manpower planner is particularly interested in manpower input-output tables showing that the present labour force is a function of the labour force some time ago, (number of unemployed, married women who take up a job again, immigration and the output of the education system) deducting losses due to the withdrawals from the labour source because of death, retirement, emigration, etc.

A very simplified version of such a manpower table is presented below.

Table 4. MANPOWER INPUT-OUTPUT TABLE

Inputs (t-1)		labour force (t)			withdrawals (t)
		educational level			
		prim.	sec.	high.	
Labour force					
prim.	19.50	19.48			0.02
sec.	5.95		5.88		0.07
high.	1.50			1.00	0.50
Output educational system					
prim.	0.52	0.52			
sec.	0.12		0.12		
high.	0.03				0.03
	27.62	20.00	6.00	1.00	0.62

It shows how the total labour force (given as additional information to the economic input-output table) is composed by educational level.

The table shows what has happened in the past. A similar table is required when forecasts have to be made. If from the estimated labour force in t and the withdrawals the labour force in the base year (t-1) is deducted the required output of the education system has been calculated.

Although the figures are not real they are more or less realistic and demonstrate some of the basic problems of manpower forecasts. It may be noted that the output of the education system is small compared to the stock figures. If we assume an error of estimation of say 10% to both sides i.e. that we could have estimated the required number of workers with secondary education either at 6.3 million or 5.7 million, the required output of secondary school graduates would become 0.32 million (or 2.5 times the figure presented in the table) or minus 0.18. The advice to the minister of education would have to be formulated as follows: "On the basis of our manpower analysis we can advise you either to double the capacity of secondary education or to abolish it during the forecasting period". Although this example may seem a bit exaggerated it is not difficult to come to analogous formulations on the basis of existing manpower forecasts. It also shows how important it is to make forecasts on slightly different assumptions, to apply what is called analysis of variants or sensitivity analysis. By doing so a clear understanding of the sensitivity of the final outcomes of the forecasts (e.g. number of pupils) due to acceptable variations in the factors determining the demand for graduates (e.g. growth of industrial production, emigration, etc.) may be obtained. The information so obtained is especially useful for policy makers who otherwise would attach too rigid a meaning to the outcomes of the forecasts.

The table further shows that the number of workers with primary education has gone down. To what extent reflect these differences changes in demand and to what extent may they be extrapolated? The increase in the number of workers with primary education was mainly due to the fresh supply of leavers from primary education and extrapolation of stock figures would in fact be an extrapolation of supply and not of demand. In the case of university graduates extrapolation of stock figures would in fact be extrapolation of the withdrawals (death, retirement, emigration etc.). This shows that changes in stock figures cannot be regarded as reflecting changes in demand and that analysis of changes in stock figures is necessary. Also information should be collected to what extent the stock matched demand before any extrapolation should be undertaken.

A sound starting point for manpower forecasts is the following manpower input-output table in which the same labour force is given with breakdowns to branch of industry, occupation, educational level attained and the withdrawals to death, retirement and emigration. It shows that the labour force among branches of industries shows different compositions to occupations and educational levels. This is one of the reasons why manpower forecasts are preferred to be made on the basis of these breakdowns. It permits to give due weight to anticipated changes in economic structure, to those of occupational structures within each industry and shifting skill mixes within each occupation.

The table presented is still a simple one. In fact further breakdowns to age, sex and more branches of industry is felt necessary. Nevertheless some problems of manpower planning can be demonstrated on the basis of the information given in the table. The number of workers in occupation 3 increased from 2.51 million to 2.57 million or by 0.06 million and withdrawals were 0.02 million during the period considered. If only this information would be available one would easily conclude that only 0.08 million pupils leaving the education system would require pre-employment or on-the-job training. The table shows that this is a mistake as in fact an inflow of 0.92 million was necessary, not so much for the reasons given above but because of occupational mobility of the workers already employed. Of these 0.92 million, 0.12 million are

Table 5. MANPOWER INPUT-OUTPUT TABLE

(in millions)

Inputs (t-1)		Labour force(t)										Withdrawals(t)		
		..	Industry								..	Death	Retirement	Emigration
			Occupation											
			3			...	15			..				
			Prim.	Sec.	High.		Prim.	Sec.	High.					
Labour force														
Agriculture														
occ. ed.														
1 prim.	6.00		0.80											
sec.	-												0.01	
high.	-													
. . . .														
10 prim.	-													
sec.	0.50													
high.	-													
Industry														
. . .														
3 prim.	2.00		1.20				0.40							
sec.	0.50			0.45								0.01		
high.	0.01								0.01			0.01		
. . . . . .														
15 prim.	-													
sec.	0.50							0.30					0.05	
high.	0.50								0.40				0.05	
. . . . . .														
Output educational system														
prim.	0.52		0.02											
sec.	0.12			0.10				0.02						
high.	0.03													0.03
	27.62	...	2.02	0.55	-	...	0.40	0.32	0.41	...	...			

leavers of the education system and the real problem would be training the older workers who shifted from agriculture to industry.

The information collected in t-1 shows that occupation 15 requires a high skill mix. The table however also shows that vacancies could be filled by upgrading 0.40 million workers from occupation 3, thereby economising on the required output of secondary and higher education. This shows that a clear insight into the possibilities of a better utilisation of the existing labour force is necessary before any target for the education system can be calculated.

The manpower table gives a systematic description of what has happened and as such provides basic information for analysis. If the information is available over successive years, for individual firms to countries as a whole and if additional information is available (salaries, capital used, production, size of enterprises etc.) time series analysis and cross section analysis at various levels of sophistication (from simple description to multi variate analysis) can be applied to individual firms, regions, branches of industry or countries.

To what extent the outcomes of these types of analysis can or should be used in either a supply or a demand forecast is not always clear. Many mistakes in forecasting can be traced back to using relations found by cross-section analysis at one point in time for estimating changes over time, while time series analysis may reveal dubious trend correlations only.

In demand forecasts most of the effort is concentrated on estimating the required labour force to branches of industry, occupation and/or educational level although - as we have seen - forecasts on withdrawals and occupational mobility are of equal importance. The methods used in forecasting are closely connected with those of analysis. Possible methods are:

1. Simple extrapolation (of total numbers or "densities"). (1)
2. Simple comparison. ("The whole industry will need the same manpower structure as now is shown by the best, biggest, etc., firms") (2) or: "The whole country will need the same density of doctors as now is shown by the most urbanised regions".

---

(1) E.G. The long-range demand for scientific and technical personnel. A methodological study. National Science Foundation, Washington 1961.

(2) E.G. "Greece" O.E.C.D., Country Reports, The Mediterranean Regional Project, Paris 1965.

3. Stratified comparison. ("in 1980 our manufacturing industry will have the same productivity as now prevailing in the U.S.A. In 1980 we therefore must have the same manpower structure as today in the U.S.A.") (1)
4. Using relationships found in the past (e.g. between number of engineers and volume of production per sector). (2)
5. Intuition, feeling ("We assume that ...."). (3)
6. To put the burden and responsibility on someone else (e.g. by sending out questionnaires to employers). (4)
7. A combination of 1 - 6.

Some of the relations used are shown in the graphs.

A number of variants on the approach given above is possible by concentrating not on the cells of the input-output table but on some of the row or column totals.

---

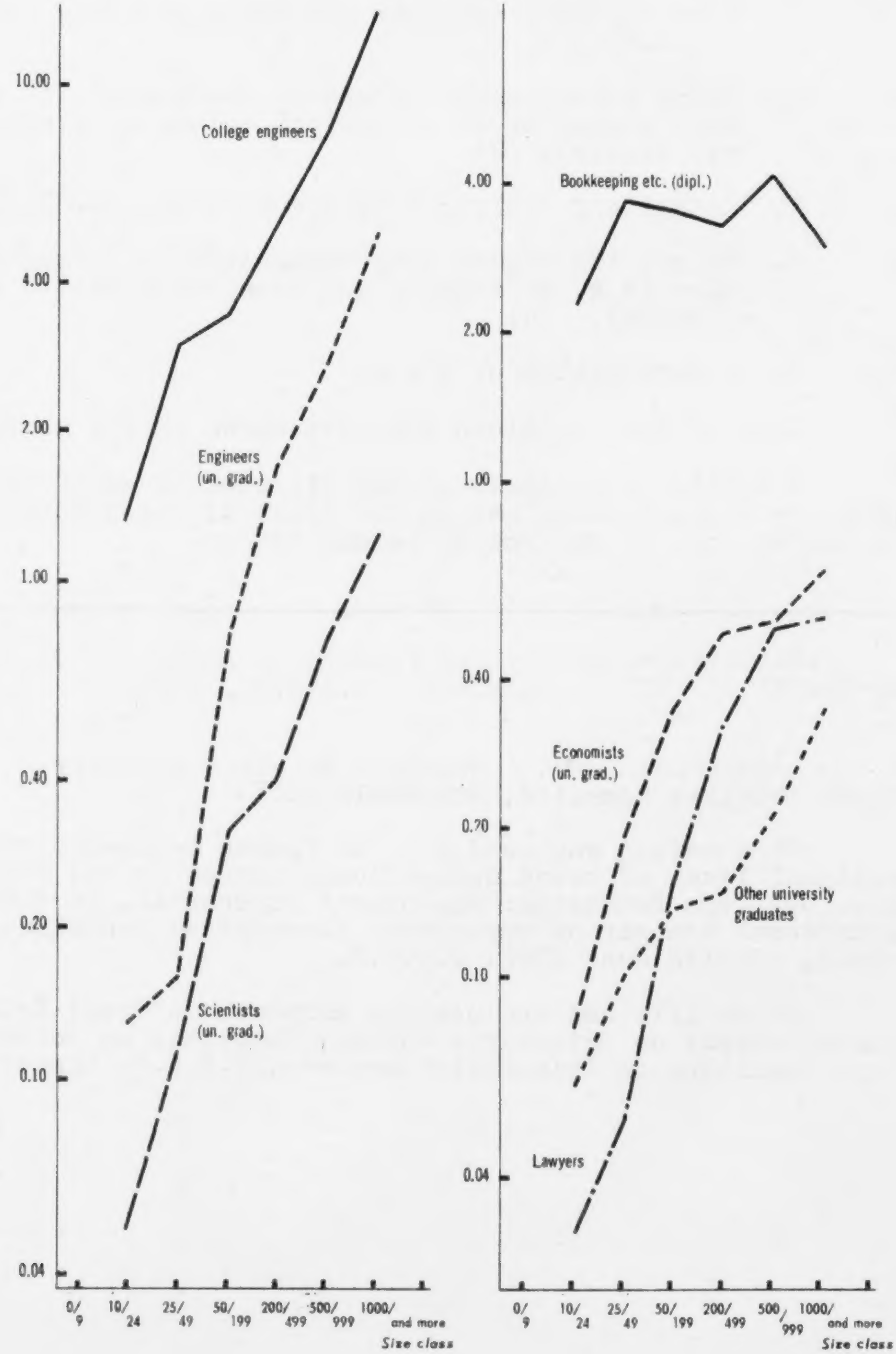
(1) Educational Policy and Planning : Austria. "The requirements of skilled manpower", O.E.C.D., 1968.

(2) Ingeniörsbehovet i Sverige. Sveriges Industriförbunds Tekniker kommitté, Stockholm 1957.

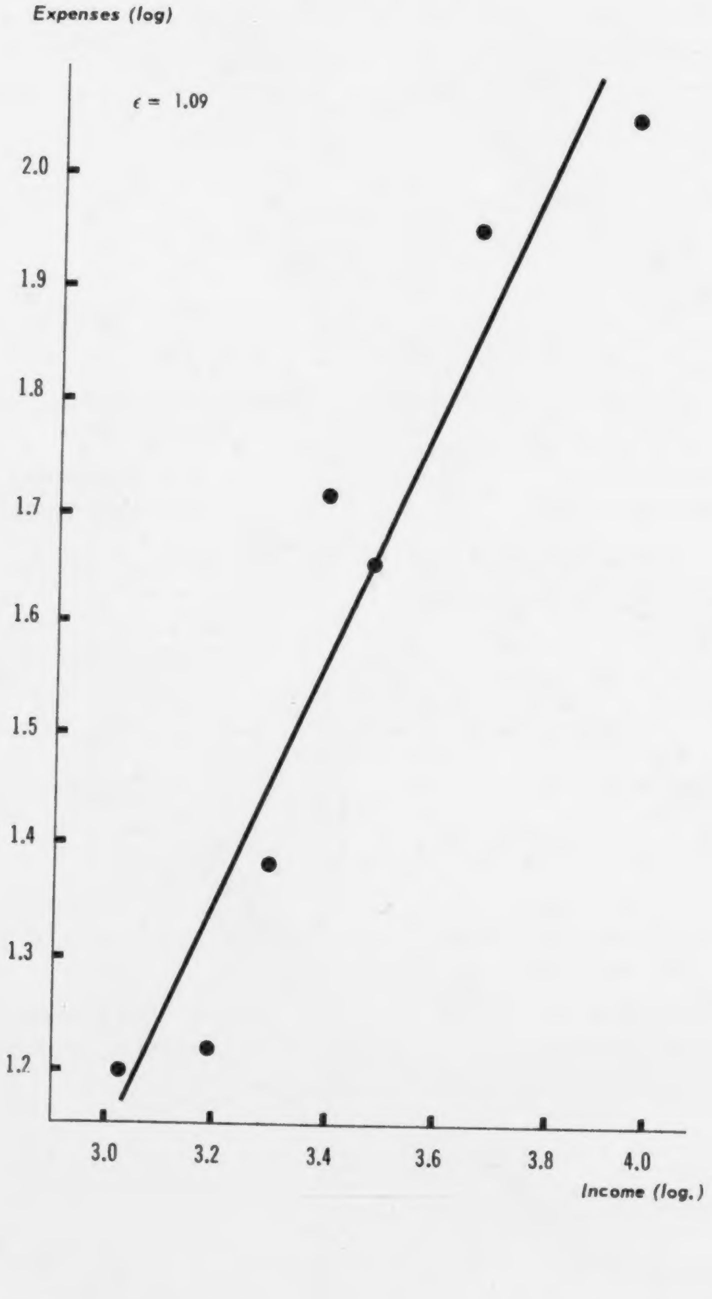
(3) This method was used e.g. in France to assess the educational level of broad occupational groups in the far future. See Jean Fourastié: Employment forecasting in France. International Seminar on employment forecasting techniques, Brussels, 4th-7th June 1962. O.E.C.D.

(4) Scientific and engineering manpower in Great Britain. Advisory Council on Scientific Policy, Committee on Scientific Policy, Committee on Scientific Manpower, H.M.S.O. London 1959.

NUMBER OF HIGHLY TRAINED PERSONNEL PER 1000 OF TOTAL NUMBER OF WORKERS IN INDUSTRY TO SIZE CLASS OF ENTERPRISE 1955 (THE NETHERLANDS)



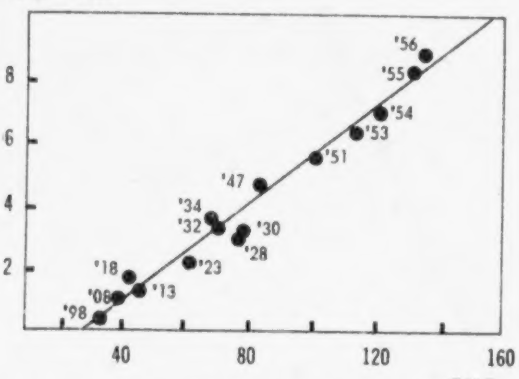
EXPENSES FOR MEDICAL CARE AND AVERAGE INCOME
(600 families)



NUMBER OF ENGINEERS AND GNP, 1900-1956 (GNP 1949=100)

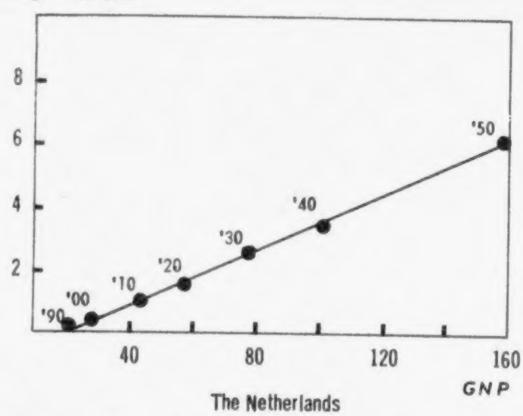
The Netherlands

TOTAL



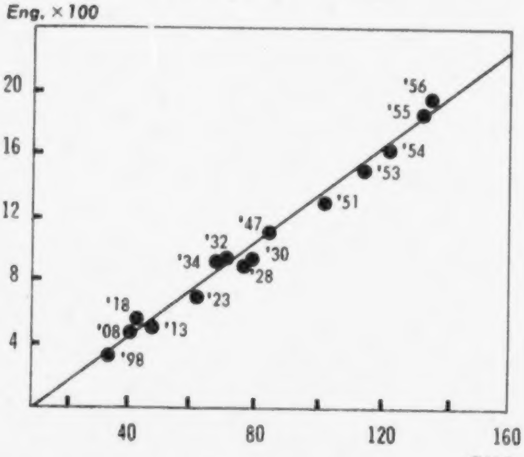
U.S.A.

TOTAL



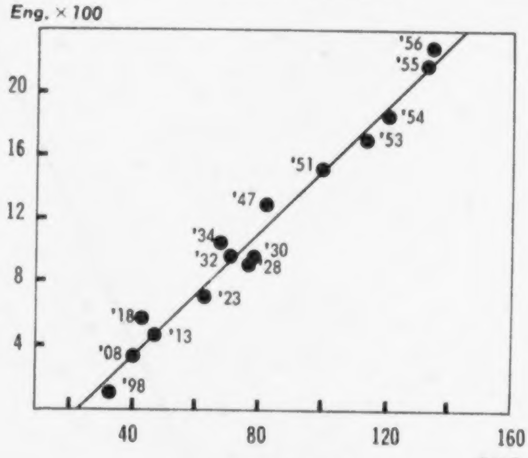
The Netherlands

HYDRAULIC ENGINEERING



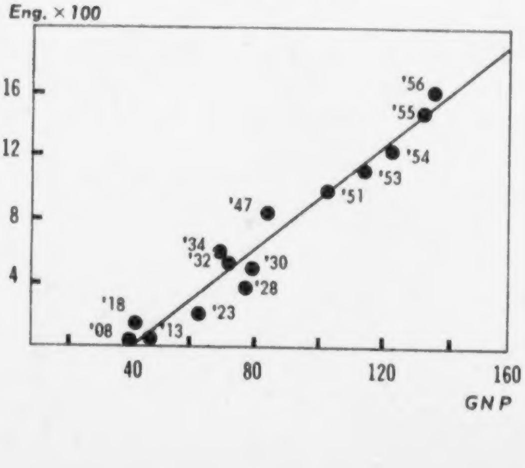
The Netherlands

MECHANICAL TECHNOLOGY



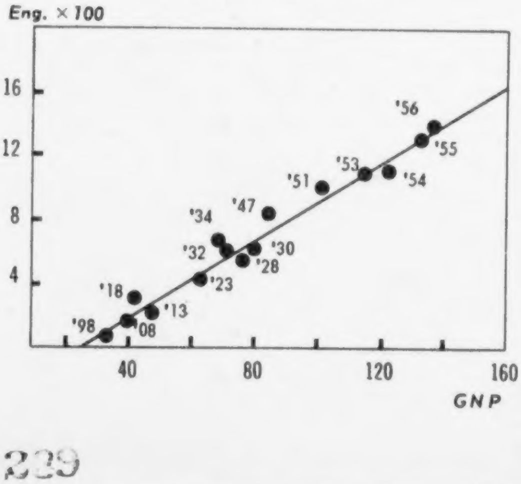
The Netherlands

ELECTRO-TECHNICS



The Netherlands

CHEMICAL TECHNOLOGY



A rather common variant is e.g. estimating the demand for engineers by using the global relation between total volume of production and total number of university trained engineers employed. This implies a complete reduction of the economic input-output table and of the manpower input-output table.

The various methods used are subject to severe criticism. So in the case of extrapolation a down-to-earth criticism is formulated as follows: what in fact is done is extrapolation of the mistakes of the past. This criticism also applies to those methods which use some kind of relation e.g. engineers and volume of production. This criticism shows how important it is to judge past developments in the number of skilled manpower and its utilisation. Against the method of simple comparison many criticisms can be raised, one of these being that e.g. the density of engineers, or doctors in the firm, industry or region, which is taken as the target figure will also increase further. This shows that further analysis of the differences in densities are necessary. As regards the questionnaire method it is rather difficult to judge if employers can forecast their demand for highly skilled personnel correctly. The experience in e.g. the U.K. shows that it is doubtful if this method can give correct estimates (1).

As a serious problem is seen the fact that even rather sharply defined jobs(I.S.C.O. four digits' code) show a wide skill mix.

In trying to estimate the demand for college engineers in the Netherlands it was found that 85% of the stock is working in 41 occupations. The skill mix of some of these occupations is shown below.

---

(1) Scientific and Engineering Manpower in Great Britain, H.M.S.O.,London 1956.
Scientific and Engineering Manpower in Great Britain, H.M.S.O.,London 1959.
In 1956 employers were requested to assess their additional demand for engineers over the period 1956-1959. In 1959 the investigation was repeated and employers were also asked to give the additional number of scientists and engineers actually employed in the period 1956-1959. On the basis of this material one can calculate that there was a very low correlation between additional demand and additional employment. It is remarkable that the correlation between the demand figures of 1956 and 1959 respectively was higher, though still low. A cynical interpretation of these outcomes could be formulated as follows: employers have fixed ideas about the demand for scientific and technical personnel, do not act accordingly and are not corrected by experience.

Table 6. NUMBER OF WORKERS PER OCCUPATIONAL
TO EDUCATIONAL LEVEL, 1969

(In percentage)

Code no.	Occupation	Educational level (1)						Total
		Primary	Secondary modern	Grammar school level	Engineering college	College level	University	
00.11	architect	7	13	19	46	6	9	100
011.11	construction draughtsman	6	59	19	16	0	0	100
011.84	electrician	3	20	25	51	1	0	100
29.83	cost calculator	15	58	22	5	0	0	100

(1) highest level attained.

Information of this kind suggests that the occupation can be filled by persons with different educational background, or, stated somewhat differently, that the relation between occupation and education is weak. More positively interpreted one could say that given the economic targets, educational requirements can be calculated between wide margins only. (1)

---

(1) Further regional analysis of statistical information on occupations and educational levels in the Netherlands suggest that even if the numbers in the various occupations could be assessed exactly the calculated number of college engineers might show variations of 15% to both sides without giving systematic complaints of either employers (in case the minimum estimate would be reached) or of college engineers (in case the maximum number would be reached). The effect of these variations in stock required on the required flow of graduates is as said before very great indeed.

The weak relation between occupation and education and the feeling or experience that unpredictable changes in technology affect heavily the occupations, the number of workers in these occupations and the occupational content, has led to the tendency to skip the occupational breakdown in the manpower table or to reduce the number to a few very broad groups.

More pragmatic criticism stems from policymakers who find that the outcomes of long term forecasts turn out to be wrong (and mostly too low) already in the second or third year. When analysing forecasts in the field of manpower it turns out that forecasters are to a great extent determined by the actual situation. This can be demonstrated for the Netherlands by the following table.

Table 7. ACTUAL AND FORECASTED REQUIRED NUMBER OF MEDICAL DOCTORS PER 100,000 OF POPULATION SINCE 1930 IN THE NETHERLANDS

Author Committee	Base		Target year and density						
	year	density	1940	1950	1960	1965	1970	1975	1980
Limburg	1934	58	58	-	-	-	-	-	-
Verdoorn	1950	69	-	-	87	-	-	-	-
Zeegers	1947	73	-	-	106	-	-	-	-
Dalmuder	1957	100	-	-	102	106	109	112	115
Goudswaard	1962	111	-	-	-	-	-	-	140

Most of the criticism on the forecasting methods have to be accepted as correct. This is to a large extent the consequence of scanty statistical information which at the best provides manpower planners every 10th year with a manpower matrix. What is required is not a manpower matrix of stocks at a given point in time but an input-output table showing flows of the various types of workers (with breakdowns of educational level, personal and sociological characteristics) to various occupations (characterised by various job requirements, salaries, etc.) to different employing institutions (characterised by e.g. size, capital invested, economic sector, etc.). Here a comparison can be made with educational forecasts. Better statistical information on the flow of pupils through the education system, in conjunction with better information on personal and sociological characteristics of the pupils and the characteristics of the various types of schools has led to a better insight in the educational process and to better forecasts. Similar information should be available in the field of manpower.

c) Table 5 showed as a labour input the leavers of the education system. In what way these are produced is shown in table 8: a simplified educational input-output table in which information is also given on additional inputs viz. teachers and expenditures (1). The table shows where pupils from a given grade go (read the rows) and where pupils come from (read the columns). It provides basic information on key parameters of the education system: transfer rates, rates of repetition, drop-out rates, pupil teacher ratio's, cost per student, etc. The table shows e.g. that of the 600 thousand pupils in grade 6 of primary education, 100 thousand are found again in grade 6 one year later (repeaters), 350 thousand (certificated) go to secondary education, 50 thousand enter society as drop-outs and 100 thousand as certificated. The transfer rate from primary to secondary education is

$$\frac{350}{350 + 100}$$

etc.

Given forecasts about the number of the five year old population and keeping transfer and transition rates etc. constant we can easily calculate the numbers in t by substituting t - 1 enrolment for that of t - 2. To give an example, in 1961 enrolment in grade 6 of primary education was 650 thousand while it was 600 thousand in 1960. So by multiplying the figures in the appropriate row by 650/600 we get in 1962 the number of repeaters, those going to secondary education, drop-outs and certificated who enter society. Repeated calculations of this kind give the required outcomes for consecutive years. The calculations can as a matter of fact also be reversed. Starting with the required number of graduates, the required enrolment and intake figures can be calculated.

Table 8 presents a simplified form of an input-output table. Necessary are further breakdowns to more types of education, to sex age and other personal characteristics (intelligence, income and social class of parents) etc., while for further analysis the same information is required for the total numbers of the population in the corresponding breakdowns.

The methods of analysis and of forecasting the key parameters are similar to those used in manpower analysis and forecasting. Also here time-series and cross-section analysis

---

(1) In the manpower table drop-outs of secondary and higher education are classified under primary and secondary level respectively.

Table 8. EDUCATIONAL INPUT-OUTPUT TABLE(a)

Inputs (t-2)			Pupils (t-1)									Outputs (t-1)	
			Type of education										
			Primary(1)			Secondary(2)			Higher(3)			Drop-outs	Certificated
			Grade 1	...	6	1	...	6	1	...	6		
5 years old			900										
Type	**Grade**	**No.**											
	- 1	800	100	650								50	
Primary(1)	- :	:			550							:	
	- :	:										:	
	- 6	600			100	350						50	100
	- 1	300				50	230					20	
Secondary(2)	- :	:						190				:	
	- :	:										:	
	- 6	200						20	100			20	60
	- 1	100							20	70		10	
Higher(3)	- :	:										:	
	- :	:									50	:	
	- 6	50									10	10	30
Grade enrolment			1000	...	650	400	...	210	120	...	60		
Enrolment				4000			2000			500		6500	
Teachers				100			100			100		300	
Personnel expenditure				1000			2000			3000		6000	
Material expenditure				40			40			15		95	
Students aid				-			-			500		500	
Capital expenditure				100			200			1000		1300	
Total expenditure				1140			2240			4515		7895	

(a) Pupils and teachers in thousands, expenditures in millions of dollars.

at various levels of sophistication (from simple description to multivariate analysis) can be applied to individual schools, groups of pupils, regions and countries (1).

Possible forecasting methods are:

1. simple extrapolation
2. simple comparison
3. stratified comparison
4. using relationships found in the past
5. intuition, feeling
6. using the results of questionnaires
7. combination of 1 - 6.

Variants on the approach outline above can be made by concentrating not on cell information but on some parts of the border information of the input-output table. A rather common variant is e.g. simple extrapolation of the number of pupils in or graduates of the various types of education, which in many cases will lead to acceptable forecasts.

As the methods of forecasting are similar it is not surprising to hear similar criticism (though in different wordings) as that on manpower forecasts.

7. Making forecasts is like travelling in a night train. One knows where one started but it is difficult to see whether one goes in the right direction. Therefore special attention should be given to check the outcomes of the forecasts. International stratified comparison may be helpful in this respect. It would be preferable to check the various intermediate outcomes and also a check on the final outcomes e.g. educational targets based on manpower forecasts is acceptable. How powerful such a check is can be shown by taking any manpower/education plan e.g. the Greek plan (2).

Sponsored by the OECD and as part of the Mediterranean Regional Project, the Greek M.R.P. team has formulated an educational plan based on a systematic analysis of manpower needs and the social demand for education.

---

(1) A more elaborate discussion of some methods can be found in: The past and future inflow of students into the upper levels of education in the Netherlands, by R. Ruiter, OECD 1963.

(2) "Greece". Country Reports, the Mediterranean Regional Project, OECD Paris 1965.

Methods used

It is stated in the report that employment per sector has been calculated by a careful appraisal of factors likely to effect both output and productivity. So something of the input-output analysis may have been undertaken.

Statistical information permitting to draw up a manpower input-output table was not available and therefore the team had to concentrate on some border information of this table successively i.e. a manpower matrix showing employment with a breakdown to occupations per branch of industry, separate information on educational qualifications and emigration per occupation and "leakages" for the various categories of graduates. Lacking an input-output table the team could not study thoroughly such problems as occupational mobility, the role of respectively government (formal education) and of private industry (up-grading, better utilisation of existing personnel, on the job training) in reaching the manpower targets.

As regards the required composition of the labour force to occupation and educational level per sector (the manpower matrix) the Greek team arrived at interesting conclusions which are summed up below. The most difficult sector for the planners has been agriculture. The team recognised the need for more highly educated farmers but also that farmers' sons with secondary or higher education are difficult to persuade to remain in agriculture (1).

The Greek team facing these problems puts its hope on

a) more and better short term practical courses for farmers,

b) more and better rural youth clubs,

c) strengthening of the specialised services of the Ministry of Agriculture,

d) the influence of a lengthening of compulsory education.

The team found that in industry there is a close correlation between average size of the form and occupational structure. In view of these facts the future manpower structure in the various industrial branches has been assumed to depend very largely on the anticipated changes in the average size of the firms. In the service sector no clear-cut method has been used. One can say that the method used here was the feeling of the planners. A notable exception has been the medical sector for which an international comparison was used.

---

(1) This holds not only for Greece but for almost any country in the world and not only for agriculture but for small to medium sized commercial and industrial firms as well. This clearly demonstrates that more formal education is not always a successful instrument to raise the (educational) level in a particular sector.

The Greek team faced many difficulties in translating the occupational requirements into educational requirements. They found that the link between occupational and educational qualification is by no means rigid. There was a rigid link only if this had been made by law, tradition or labour-union policy. When this was not the case they had to make arbitrary assumptions, e.g. that 40% of the new managers during the period 1962-1974 must have an economic or commercial degree.

After thus having estimated the number of workers per educational category the required output of the education system was calculated which by means of a reduced educational input-output table has been translated into required enrolment. In establishing enrolment targets not only the educational requirements in view of manpower needs were taken into account, but also the social demand for education (for primary education and the first cycle of general secondary education). This first cycle should be expanded in such a way that in 1974 a policy of nine year compulsory education can be implemented.

It may be noted that the model used can be considered as a special case of the general model. The experience of the Greek team shows that rigid methods of forecasting cannot be applied in practice and that many arbitrary assumptions have to be made.

Targets and policy measures

The target figures for education based, in particular, on the manpower forecasts can be summarised and compared with the actual situation.

The most important proposed measures are:

1. Gradual extension of the period of compulsory education which should be of 9 years in 1974. This effects especially general secondary education.
2. Rapid expansion of technical and vocational education.
3. Establishment of a new university (especially technology).
4. Lowering of pupil-teacher ratios.
5. Sharp increase in teachers' salaries.

Item 4 and 5 make that notwithstanding the rather modest increase in the total number of pupils, a sharp increase in expenditure on education is necessary.

Table 9. ACTUAL AND TARGET ENROLMENT IN GREECE

	Actual (1961)	Targets (1974)	% increase
Enrolment			
Primary education (x 1000)	896	891	..
General secondary education (x 1000)	273	370	35
Technical and vocational education (x 1000)	43	87	100
Higher education (x 1000)	28	45	60
	1,240	1,393	12
Enrolment ratios (as % of age groups)			
Total enrolment (6-24)	47	52	10
Secondary general education (12-17)	32	41	30
Technical education (12-17)	5	10	100
Higher education (18-23)	3.5	5.4	55
Expenditure on education			
Total (million drachmen)	2,235	8,245	270
As % of G.N.P.	2.1	3.2	50

International comparison

In order to check the educational targets formulated by the Greek team by means of international stratified comparison the following table has been made. This shows the situation in Greece in 1961, the target figures for 1974 and the situation in other European countries round 1960.

Table 10. COMPARISON BETWEEN GREECE AND OTHER EUROPEAN COUNTRIES

	Greece		Other European countries (± 1960)							
	1961	1974	Belgium	United Kingdom	France	Norway	Netherlands	Sweden	Denmark	Switzerland
Enrolment, etc.										
Total enrolment as a percentage of age group 6-24	47	52	60	59	59	57	55	54	49	49
Graduates general secondary education as a percentage of 18 year olds	18	.	11	6	11	6	12	11	6	6
Enrolment technical and vocational education as a thousand of total population	5	10	23	.	12	43	13	23	20	17
Graduates higher education as a percentage of 23 year olds	3.6	5.4	3.3	3.4	3.4	1.7	2.8	4.3	2.2	4.7
Polytechnical students as a percentage of students in higher education	8	-	13	14	-	25	19	15	22	17
Pupil teacher ratios										
Primary education	40	30	-	28	28	-	-	22	31	26
Secondary general education	40	28	-	18	25	22	-	21	-	22
Technical and vocational education	29	25	-	18	16	16	-	-	-	-
Higher eudcation	22	15	-	8	14	8	-	17	-	10
Miscellaneous										
Duration compulsory education (in years)	6	9	8	10	9	8	7	9	9	9
G.N.P. per capita (x 100 U.S. dollars)	4	9	-	13	12	9	-	15	11	14
Expenditure on education as a percentage of G.N.P. ...	2.1	3.2	-	3.7	3.5	4.2	-	4.1	3.0	2.9

It may be noted that in 1974 Greece may have a G.N.P. per capita lower than most other European countries now.

The table suggests the following with regard to education in Greece.

1. Extension of compulsory education to 7 or 8 years but not to 9,
2. No expansion of general secondary education,
3. An increase in technical and vocational education greater than foreseen by the Greek team,
4. No expansion of higher education but a redistribution of students over the faculties (more emphasis on technology),
5. Sharp reduction of pupil-teacher ratios.

Both approaches reach by and large the same conclusion: quantitative expansion of the education system should be small and emphasis should be put on a qualitative improvement: i.e. redistribution of students over the types of studies (more in technical and vocational education at both secondary and third level) and reduction of pupil teacher ratios.

There are also differences. There are indications in the Greek report that the proposals based on the international comparison should be preferred to those of the Greek team.

The check on the outcomes of the forecasts of the Greek team seems to be so powerful that international stratified comparison seems to be justified as a direct method of assessment of required educational expansion (1).

8. Summary and conclusions.

There is a growing consensus among manpower and educational planners about the approach to be followed. In this approach three input-output tables are of fundamental importance as their aim is to get a firm grip on the three problem areas in manpower and educational planning viz. economic growth, manpower requirements and educational expansion. The methods of analysis and of forecasting are similar in these fields and can be applied in demand forecasts (which start with studying possible economic growth) and supply forecasts (which start with an assessment of possible educational expansion) and to individual employing institutions or individual schools or to countries as a whole.

---

(1) This has been done in Puerto Rico only as far as I know.

As expansion of education facilities will remain determined by demand and supply factors it will be necessary to develop a dual way system in which educational authorities are confronted with the demand for skilled workers and employing institutions with the expected supply turned out by the education system. An educational plan will have to take into account both supply and demand forecasts.

The methods and outcomes of the forecasts have been criticised rather severely. This criticism can be overcome partly by regular revision of the forecasts, introduction of alternatives or variants and more experience of the planners. Whatever criticism can be raised against manpower and educational forecasts they will remain necessary, one of the reasons being the sharp increasing outlays on education. It will be wise, however, to regard the outcomes of the forecasts not as strict targets for policy but as global indications and forecasting as a means to rationalise discussions in the field of manpower and education.

APPENDIX I

COUNTRIES INCLUDED IN TABLE 1

GROUP 1	GROUP 2	GROUP 3	GROUP 4	GROUP 5
1. Upper Volta	21. Nigeria	41. Tunisia	61. Lebanon	81. Austria
2. Nepal	22. Thailand	42. Peru	62. Mexico	82. Netherlands
3. New Guinea	23. Haiti	43. Guatemala	63. Colombia	83. Finland
4. Somalia	24. Kenya	44. Iran	64. Spain	84. Federal Rep. of Germany
5. Rwanda	25. Cambodia	45. Ghana	65. Greece	85. Norway
6. Burundi	26. Congo (Kinshasa)	46. Philippines	66. Costa Rica	86. Denmark
7. Burma	27. Sudan	47. Senegal	67. Chile	87. France
8. Afghanistan	28. Rep. of Viet-Nam	48. Equador	68. Panama	88. Belgium
9. Tanganyika	29. Angola	49. Iraq	69. Singapore	89. United Kingdom
10. Pakistan	30. Bolivia	50. Honduras	70. Japan	90. Australia
11. Uganda	31. Rep. of Korea	51. Turkey	71. Cuba	91. New Zealand
12. Sierra Leone	32. Central African Rep.	52. Ivory Coast	72. Jamaica	92 Sweden
13. Mozambique	33. China (Taiwan)	53. El Salvador	73. South Africa	93. Switzerland
14. Niger	34. Madagascar	54. Dominican Republic	74. Uruguay	94. Canada
15. Indonesia	35. Mali	55. Algeria	75. Argentina	95. United States of America
16. Chad	36. Guinea	56. Nicaragua	76. Ireland	
17. Dahomey	37. Ceylon	57. Fed. of Malaya	77. Italy	
18. India	38. Paraguay	58. Portugal	78. Israel	
19. Togo	39. Libya	59. Brazil	79. Puerto Rico	
20. Laos	40. Morocco	60. Hong Kong	80. Venezuela	

NOTE
ON FORECASTS OF REQUIREMENTS FOR ENGINEERS, MANAGEMENT AND PROFESSIONAL STAFF

(Carried out in the French Metal Industries)

by
Y. CORPET

In 1956, the Union des Industries Métallurgiques et Minières undertook a survey of engineers and top-level staff in the metal industries.

It had two objectives:

- to obtain an accurate knowledge of the number of staff in this category, and its skill structure;
- to determine its quantitative and qualitative annual requirements in the immediate future, and in the short, medium and long terms.

I. GENERAL FRAMEWORK OF THE SURVEY

The first problem was to define the limits of this category, particularly its lower limit. Two years earlier a similar survey had been made of technical assistants and technicians; such staff would not therefore be included in the new survey.

As a general indication, firms were told to count as engineers and managers only staff classified as "cadres", (1) with the exception of those in grades below a given level fixed in collective agreements.

Secondly, it was necessary to determine the scope of the survey, for which there were three possibilities:

- first decide on the sampling and then send the survey questionnaire to the firms selected;
- send the questionnaire to all firms;
- send the questionnaire to certain types of firms without first deciding on the sampling.

---

(1) This may be loosely translated as professional and management staff.

For the sake of convenience, the last solution was adopted and a questionnaire was sent to all firms with over 100 employees.

The extent to which the replies received were a representative sample was checked a posteriori and some adjustments were made in the gross results obtained in order to take account of the real weight of each occupational sector in relation to the metal industries as a whole.

The extent to which replies were representative was also examined though more generally, - according to a breakdown of replies by size of the firm's labour force.

The two criteria for classifying replies were, as has been indicated:

(i) the occupational sector to which the firm belonged, e.g. iron and steel, automobile construction, aircraft construction, etc...;

(ii) size of labour force: firms between 100 and 250 salaried employees, between 250 and 500, between 500 and 1,000, etc.

We must stress the fact that the survey was carried out by means of a questionnaire sent to firms directly or through the regional professional associations; the quality of the replies thus depended on the ability and competence of the persons who made them.

There was no doubt concerning the validity of the replies for questions without subjective content, i.e. for those designed to obtain an exact picture of the present situation.

The three parameters chosen for the analysis of the population under survey were:

- function occupied (commercial, administrative, technical, etc.)
- education and training received (diploma held)
- age, by 5-year groups.

II. CONTENT OF QUESTIONNAIRE

Apart from general data relating to the occupational sector to which the firm belonged and to the total number of employees, the questionnaire contained four sections in the form of tables to be completed.

The first table was designed to classify staff according to function occupied and diploma held: 8 types of functions and 24 types of training were listed.

No interpretation on the part of the firms was required in order to complete this table; after processing and extending results to the metal industries as a whole, it was found for instance, that in 1956 the industries contained about 1,780 graduates of the Ecole Polytechnique, of whom so many were in each occupational sector and so many in each type of function.

Naturally a large number of change-overs were made between occupational sectors, training and functions occupied.

The second table was identical to the first in form, but the reply was more difficult and subjective as it involved giving a picture of the existing situation but also indicating what was regarded as an ideal distribution at the time of the survey.

This revealed, for instance, that at the date of the survey the metal industries were able and actually needed to recruit immediately 5,760 engineers and managers.

Replies to this table also showed, for example, that instead of such and such a percentage of engineers or top level staff with a particular training or occupying a given type of function, some other percentage was considered desirable.

Such data were naturally used for forecasting requirements.

The third table was designed solely to classify engineers and top level staff by function and age, so that replacement rates might be calculated on the basis of mortality tables and retirements.

The nature of the fourth table was somewhat uncertain, since it asked for the number of additional engineers and top level staff required in each category of function in order to secure a production increase of 25%, 50% and 100% without indicating any time-limit. These data, however uncertain they might be, were nevertheless necessary for forecasting requirements since, at that time, no one had any idea what the past trend in the percentage of engineers and top level staff had been in relation to total employed and to the increase in production.

III. DATA PROCESSING

As already indicated, the first objective of the survey was to obtain an exact knowledge of the quantitative value of the category "engineers and top level staff" and of its qualitative structure.

We may consider that this objective was very satisfactorily achieved: the situation was analysed in terms of occupational sectors, size of firms, functions occupied, training received and age distribution.

The second objective was to determine annual requirements.

In order to do this, it was decided not to take account of requirements due to vacancies caused by engineers and top level staff leaving the metal industries of their own accord for other economic sectors, but consider only requirements due to three causes:

- replacements for retirements or deaths;
- overall variation in numbers employed in the metal industries ;
- variation in relative size of the category "engineers and managers" as compared with the total labour force.

These are requirements due to:

the demographic situation

economic trends

technical and technological developments.

1° Demographic requirements

Knowledge of the age pyramid for engineers and top level staff combined with the simplifying assumption that retirement for all will be at 65, enabled us to calculate replacements, on the basis of the mortality tables, at an overall rate of 2.5 per cent.

With this rate we could calculate annual requirements of new staff to replace those who had retired or died.

2° Economic and technical requirements

These requirements were calculated globally on the basis of firms' replies concerning the number of additional engineers and top level staff they would require in order to increase their production by 25, 50 or 100 per cent.

In the light of the annual average increase in production for the metal industries as a whole in previous years, calculations were made for 3 assumptions for the future annual increase in production, viz. 3%, 4.5% and 6% .

For each of these assumptions we calculated the dates which would correspond to overall production increases of 25, 50 and 100 per cent and what the number of engineers and top level staff should be at these various dates according to the firms' replies.

The annual requirements retained were those corresponding to the middle year of each period.

Having thus established average annual requirements for engineers and managers, we had to break them down according to functions and types of training.

For this purpose two series of calculations were made:

- in one case we assumed the maintenance of the existing breakdown by function and training;
- in the other we assumed a breakdown along the lines the firms had indicated as desirable.

Taking the mean between these two extreme assumptions, we finally determined the number of graduates of each type required annually by the metal industries and also the number of employees likely to be up-graded from the ranks each year to the "engineer and top level staff" category.

The Union des Industries Métallurgiques et Minières, being in possession of these data, carried out an identical survey six years later, in 1962, but with a finer analysis of categories of functions and types of training.

It was thus possible to compare the earlier forecasts with the actual changes in the situation; in addition, for subsequent forecasts, the subjective element in some replies to the questionnaire could be least partly corrected by the actual knowledge of what had in fact happened in the previous few years.

In principle a further survey of the same type should be carried out in 1968; we shall then have three accurate observations spread over a period of 12 years. There is no doubt that requirements can then be forecast with greater and sufficient precision for the period 1968-1980.

IV. GENERAL OBSERVATIONS

It is possible to make a number of general observations and remarks as a result of the surveys mentioned above and those on other categories of personnel.

To put these observations in their proper context, we must point out that they apply to an economic sector comprising a large number of employees (about 2,000,000 in 1960) and in process of expansion as regards production, labour force and productivity.

The value of the results obtained might be less positive for an economic sector with a small labour force and whose expansion was not so steady as that of the sector under review.

1st observation: Possibility of valid forecasts

With the foregoing reservations, the first very important observation is that we now know it is possible in most cases to make manpower requirement forecasts at sector level with an acceptable margin of error.

If the industries wish to take the necessary trouble, they now have the possibility of giving the authorities or organisations responsible for education a good idea of their personnel requirements for each level of training.

In any case, this result can be obtained only if the situation has been well studied beforehand; earlier observations, showing past trends, would be a great advantage.

In other words, we should not be content with an isolated survey, but should establish a system of regular surveys.

In the French metal industries an annual survey showing the breakdown of staff by occupational category has been carried out since 1958. In addition, six much fuller surveys of the type studied above have been made in the past 12 years, viz.:

- 2 on technical assistants and technicians in 1954 and 1964

- 2 on administrative and commercial employees in 1960 and 1966;
- and 2 on engineers and top level staff in 1956 and 1962.

Various sample surveys have also been made on operatives to obtain a breakdown by level of skill, training and function.

To sum up, serious forecasting calls for permanent machinery for systematic studies and surveys.

2nd observation: "Dynamics of requirements"

The second observation arises from the fact that, in the case in question, forecasts were intended to be translated into training requirements. Here there is a very important concept which might be called the "dynamics of requirements".

As a general rule, a firm's requirements for a certain type of training apparently depend to a large extent on the number of persons being trained per annum.

In other words, firms' wishes are governed by the qualitative state of the labour market.

The following example illustrates this point.

The survey carried out in 1956 in the French metal industries showed that, at that time, 34% of those classified as engineers and top level staff had no higher education diploma, and that firms hoped this percentage would be no more than 25% in future.

An identical survey carried out in 1962 showed that, contrary to what the firms had hoped, this percentage, instead of falling, had risen from 34% to 42% ; at the same time, firms had become less demanding since for the future they were willing to accept 35% of non-graduates instead of the 25% desired in 1956.

Other examples could be quoted on the same lines.

For a type of training which is not yet very widespread, firms express limited requirements, but these increase as the supply of trained men improves.

This brings out one of the difficulties of forecasting at firm level; on the other hand, as soon as the industry as a whole is considered, it is easier for professional associations to make compensatory adjustments.

3rd observation: Firms are not very aware of changes in personnel structure

Another difficulty in forecasting at firm level is brought out by a third general observation.

Experience has shown that, except in very rare cases, a firm is not able to say what its requirements will be, whether in the near or distant future.

This is the reason, in the surveys discussed in this report, why firms were asked to estimate their additional staff requirements on the basis of increased production rather than in so many years.

The replies to this question in the second survey, when compared with the actual trend in previous years, showed that, although firms generally made a fairly good estimate of the overall trend in productivity and hence of the variations in total labour force in relation to production, they were not very aware of important changes occurring in the breakdown of staff by occupational category.

Only a knowledge of these changes allows us to analyse, at overall sector level, requirements due to technical and technological developments influencing personnel structures.

At this overall level, it is possible, if regular statistics are available, to follow the production trend for a sector at the same time as the corresponding variation in the percentage of each occupational category in relation to the total labour force.

One may question, of course, whether the two difficulties just mentioned concerning the forecasts of individual firms are fundamental or whether they exist only because firms have not usually seriously studied the problem of forecasting requirements.

A study carried out in France, also in the metal industries, shows that the problem differs according to the occupational category concerned.

If we take a situation at a given date and then calculate, for the ensuing 12 months, the staff requirements for each category on the basis of the changes in the total number employed and therefore - in production - by taking into account the average increase in labour productivity, we bring out what might be called the manpower stability for each category in relation to the variations in production.

We see that very slight increases in output have a very strong influence on worker requirements and that this influence decreases as we move up the scale to become very slight for engineers and top level staff.

We may therefore consider that, for this last category, forecasts could be made for individual firms if they were to keep particulars of this category up to date, viz. age, function, training.

This leads to a final observation: the practice of holding regular surveys of a given type encourages firms to establish a "Personnel" index containing the necessary information.

A METHOD OF FORECASTING AS APPLIED TO "TRAINING REQUIREMENTS"

by
Mr. VERMOT-GAUCHY

The educationist and the economist are still often deaf to each other's arguments. The reasons are many, of which two may here be mentioned. One is that each deals with a different facet of reality without being able to assess or define it clearly, and the other, stemming from the first, is that while the educationist provides the economist with ill-assorted information that is hard to use, the data which emerge from the forecasts of the economist are inadequate, unreliable and largely untranslatable into educational terms.

Over and above these reasons is another which embraces them all. Little progress has been made in overall methods and concepts since the seminar held in the Hague in 1959. Forecasting the "numerical requirements of the economy" and regulating resources of skilled manpower by means of flows from the educational system and in-plant promotion are subjects which were thoroughly covered more than ten years ago. The broad areas which then were unexplored still lie beyond the reach of general forecasting procedures. The result is that pioneering research into the cost and economic benefits of education for example, in the "factors of production" ... have had little practical effect, and the main job yet remains to be done.

The economist must, therefore, extend his research to all problems connected with education, since these are of direct concern to him. It will be for the educationist on the other hand to ascertain why successive educational reforms in the past have almost invariably been followed by counter-reforms. In confronting his expectations with the results observed - which were neither foreseen nor desired - he will discover that the set of postulates and concepts he has gradually built up to direct and justify his action have become increasingly incompatible with the laws which govern the internal evolution of educational systems in their relationship to social growth. When both economists and educationists are prepared to make such an effort, a real dialogue can then begin and lead to constructive ends.

Although, to be sure, this is not the subject of our discussion, it was necessary, before going further, to place it in its general context.

PART I

OBJECTIVES AND REQUIREMENTS

The incompatibility of these two terms is the cause of many misunderstandings, and it is proposed to define their content as an economist might. If the educationist could similarly express his point of view, it would be possible to state more clearly where their approaches converge or diverge.

1. THE POINT OF VIEW OF THE EDUCATIONIST AS EXPRESSED BY THE ECONOMIST

By starting with an analysis of objectives, areas and methods of educational action, the economist can classify all the problems now put forward by the educationist with comparative ease.

Three objectives. An analysis of the objectives which the teaching profession attributes to education would fill a whole library, so vast is their number and so rich their content. There can be no question therefore of basing simple rules of action on them unless they are regrouped. An economist would divide them under three headings:

- Development of the knowledge, skills and attitudes which mark the professionally efficient individual;
- Creation of the spirit of tolerance and co-operation which the individual needs to fulfil his role in the various types of environment to which he belongs;
- Stimulation of the urge to increase the cultural heritage and to devote more time to activities which enrich the spirit and broaden the attitude towards life.

In sum, the objectives of educational action would then be: professional efficiency, sociability (1), and culture.

---

(1) Sociability can be developed concurrently with professional efficiency for example, for at times the manner of teaching may well be as important as the matter taught. This second objective, which is largely associated with teaching methods, has been inserted intentionally between the two others, which find their expression more particularly in teaching curricula. In any event, the second objective does not enter into the forecasting process.

This classification does not imply any decreasing order of importance. It merely specifies the order in which the problems would appear in a forecasting process preparatory to the formulation of policy (see below). The words and their content can of course be modified. The main point is to retain the simplicity and especially the operative character of the classification.

Three areas. Educational action is exercised in three areas:

- On the rising generations, or more precisely, on the school and university population (area of traditional education);
- On the working population (area of the economy);
- On the population as a whole (area of the community). In front of a television set, the son (student), the father (worker) and the mother (non-worker) are thus culturally enriched from an identical source.

All three areas are interdependent. Thus the rapid increase in the school and university population in part occurs at the expense of the working population, that is, of the manpower resources which the economy needs for its growth. If the average length of time for studies could be reduced by only 5 per cent towards 1975, merely by improving educational efficiency, the annual gain for the economy would be an additional thousand million manhours (on the basis of present hours worked).

Three methods. Lastly, educational action may be expressed in terms of a number of methods which can be divided into three categories:

- Traditional school training,
- Systematic up-grading schemes,
- Self-education. It is obvious, for example, that the intelligent exercise of an occupation has an eminently educational quality, and that very little is required to help a man to train himself provided he really wants to learn.

Any knowledge that cannot be acquired under adequate conditions by means of self-education or, failing that, through organised up-grading schemes, must be entrusted to the school.

To sum up, educational action pursues three objectives in three areas by three methods. These parameters can serve as an effective basis for discussion of the problems which concern both the educationist and the economist, but before any solutions can be attempted an additional dimension must be introduced into the argument. This arises in conjunction with the concept of "requirements", one which in the forecasting process can temporarily replace the university concept of objectives.

2. THE POINT OF VIEW OF THE ECONOMIST AS EXPRESSED BY HIMSELF

While the economist can accept the three areas and the three methods of educational action for his own forecasting purposes, he prefers the concept of "requirements" to that of "objectives" (section a). This is because such a concept easily leads to an assessment of the numbers and types of manpower needed to promote economic growth (section b) and to the content education should have (section c).

a) Preference for the concept of "requirements"

The economist, to put himself on the same level, may be tempted to set the objectives of the community against those of education.

In a sense he would be right, since educational action can have no objectives other than those of society. Education cannot, any more than research, be an end in itself. Although both contribute to growth, caution is required on both counts. Contrary to the impression gained from most studies, growth of the economy and society is not compatible with any and all types of research or types of education. To this first reason must be added another. The mind is inclined to reason along a straight line, and is reluctant to admit that, beyond a certain limit, effects which until then were good can become bad; this is true of actions whose effects may be represented by a curve taking on maximum values. Like research, education is only a means previously deducted from the nation's resources; were the entire population to engage in research, in dispensing or in receiving education on a full-time basis, the whole country would soon be reduced to poverty.

But, in another sense, he would be wrong. If we admit that it is his function to define the objectives of society, if he were to do so he would quickly lapse into the same misunderstanding as the educationist. He is therefore wise enough to come down to a level where the future "requirements", as he more simply prefers to call them, of the economy and society can be expressed and which the methods about to be described enable to be determined (1). The notion of requirements is sufficiently flexible to embrace all the values with which educationists are concerned, while, as we shall see, the introduction of a "numerical element" in the forecasting process shows the concept to be a revolutionary one from the educational standpoint.

b) Educational requirements

Requirements, like academic objectives, are of three sorts, and concern society, the economy and the individual. Let us start with the first two of these categories of requirements.

- Future requirements of the economy :
These have a twofold aspect (Graph no.1) ;

1) A numerical aspect (No.1 in the graph). By this is meant the number of jobs in each type of occupation likely to become available to the rising generations on the one hand and to the present active population on the other. Knowledge of these requirements provides the initial information required in devising structures for the educational system (No.1'). We shall later see what this expression includes, here used in its widest sense.

2) A qualitative aspect (No.2). By this is meant the content of skills which will be required in the exercise of each occupation. Knowledge of content is a prerequisite in preparing teaching curricula for the rising generations and for continuous training of the active population (refresher training and upgrading schemes (No.2')). Were we to stop at this stage of the argument, educational action would prepare the ground for a virtual mutilation of the individual's personality ; this is what worries the educationist, for man is not simply an active agent in the economy and, as such, subject to a number of occupational constraints, but is also a member of the community.

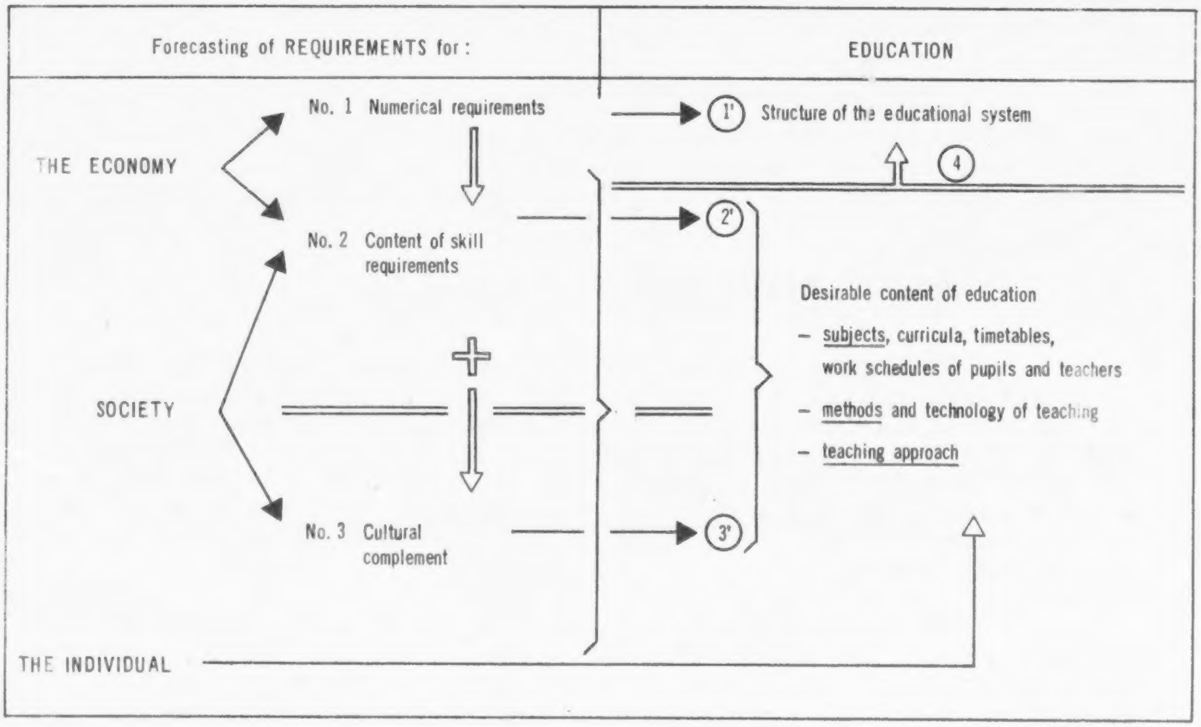
---

(1) Once obtained, the results of forecasting analysis, however, help in assessing the social objectives as formulated in the stated aims or in the decisions of the policy-making authority.

Graph 1

DEVELOPMENT OF SOCIETY AND OF EDUCATION

(MAJOR STEPS IN THE FORECASTING PROCESS)


Forecasting of REQUIREMENTS for:
EDUCATION
THE ECONOMY
No. 1 Numerical requirements
1'
Structure of the educational system
4
No. 2 Content of skill requirements
2'
SOCIETY
Desirable content of education
– subjects, curricula, timetables, work schedules of pupils and teachers
– methods and technology of teaching
– teaching approach
No. 3 Cultural complement
3'
THE INDIVIDUAL

- Future requirements of society (1). It is necessary, therefore, to determine how the content of the skill requirements must be complemented so that every individual can lead a life consonant with the advantages offered by the age in which he lives while accepting the rules of conduct which hold society together - whence the expression, for want of a better term, of "cultural complement" used under No.3 in the graph. Knowledge of this complement also has a bearing on the preparation of teaching curricula (3').

Man as a professionally efficient, social, cultivated product of education must in fact be regarded as an entity. Although the forecasting of requirements involves a conventional breaking down of the facts as they stand, unity of training and hence unity of the individual can be restored by recombining the desirable educational constituents (2' + 3'). Once this has been done, initial estimates can be adjusted in terms of the intake capacity of the various streams in the educational system (4), since the duration of studies, that is, the length of such streams, will depend on the mass of knowledge to be acquired.

Actually, the sequence of operations as shown in Graph 1 has still to be completed. Let us take the education of the rising generations as an illustration. The criteria on which the teaching profession will rely to detect individual ability by "observation" must be derived from the desirable content (2' + 3'). But the "guidance" of rising generations as determined by individual aptitudes must necessarily be organised in the light of the intake capacity of institutions paving the way between school and working life (structures at the top of the educational system), a capacity which is to meet the future needs of the economy. An important corollary is that the educational system, taken in the strict sense of the word, must be planned "downwards" from such transitional institutions and not, as the procedure so far has been, "from the bottom up", with utter disregard for what may happen at the top when the time comes for the young student to resolve the anguishing problem of his professional career

---

(1) The academic concept of objectives is largely subjective (one might almost say affective), qualitative, and concerned with cultural values obtaining in the past. It prefers to consider the individual as such, independant of his environment, and is based on a set of postulates and concepts rather than on the laws which govern life's changing realities.

The concept of requirements, on the contrary, is associated with the environment in which the child grows up and with the concrete, animate world he will be called upon to build thanks to the knowledge, skills and attitudes conferred by education.

Graph 1, however, is not complete. The numerical requirements of the economy must be satisfied both by educating the rising generations (traditional system) and by continuously training the active population (refresher courses and up-grading). A numerical balance must be found between these first two "areas" of education - how, we shall see later.

- Requirements of the individual. In most modern societies, educational content is prescribed in legal, statutory form and the curricula are laid down arbitrarily. The portion allotted to each student is determined in advance, nor can he request instruction in disciplines not included in the curricula. Should he nevertheless acquire any knowledge or skills outside the curriculum which enhance his personal attainments, he receives no credit for such efforts, even in a general knowledge examination. Consequently, the needs of the individual, or, to employ the term frequently used by educationists, the right freely to improve one's mind, can be given substance in only two ways: first by improving educational methods, making curricula more flexible and helping the pupil along the path towards the sort of learning he can absorb without difficulty, but above all by adapting education to the future needs of the economy and of society, since the rights of young people can but be betrayed if the educational system is found wanting.

Before continuing, it will be well, once and for all, to describe how the content of education, or rather the "cultural complement" to education, can be determined.

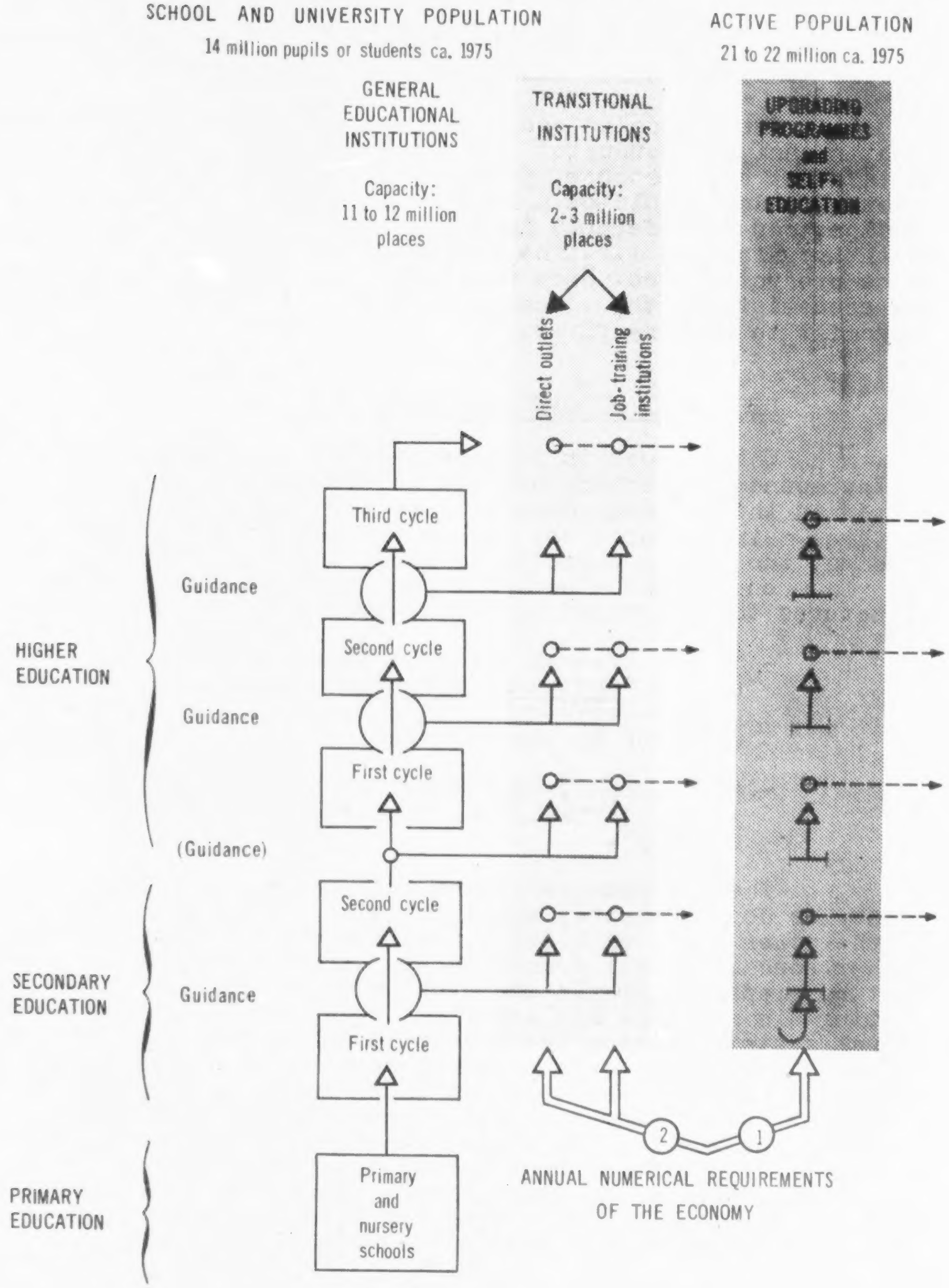
c) Educational content

It is not a matter of renovating education from scratch, but of improving the existing system. The economist can contribute information which will allow present programmes to be re-appraised and renewed, and subjects to be recombined into the fewest possible basic disciplines without sacrificing anything which deserves to be saved of the invaluable cultural heritage bequeathed by centuries of academic tradition. This contribution refers to the dual aspect of man which the economist distinguishes - that of future producer and future consumer.

We shall later see how the analysis of the "content of skills required" (producer aspect) should be approached. A study of the "cultural complement" (consumer aspect) must also be based upon information which at the present time can be fitted into a consistent framework by the economist alone. Cultural activities, for example, are part and parcel of "national expenditure", they are found in that of households, public and private institutions, etc. They are also manifest in industry, as in the graphic arts (production of books, newspapers, reviews, etc.), the manufacturing of various products (cameras, television sets, records), in the designing and entertainment industries, etc.; or even in transport (private cars

Graph 2

STRUCTURE OF THE EDUCATIONAL SYSTEM FROM THE STANDPOINT OF ECONOMIC REQUIREMENTS


SCHOOL AND UNIVERSITY POPULATION
14 million pupils or students ca. 1975
ACTIVE POPULATION
21 to 22 million ca. 1975
GENERAL EDUCATIONAL INSTITUTIONS
Capacity: 11 to 12 million places
TRANSITIONAL INSTITUTIONS
Capacity: 2-3 million places
UPGRADING PROGRAMMES and SELF-EDUCATION
Direct outlets
Job-training institutions
Third cycle
Guidance
HIGHER EDUCATION
Second cycle
Guidance
First cycle
(Guidance)
Second cycle
SECONDARY EDUCATION
Guidance
First cycle
PRIMARY EDUCATION
Primary and nursery schools
2
1
ANNUAL NUMERICAL REQUIREMENTS OF THE ECONOMY

and aircraft, sportscars and amateur flying, etc.), since a technology in full expansion is now at the service of culture, just as there is increasingly a real "educational technology", to use an expression now current in the United States. Might not one go further and consider as "a cultural complement" all the information man must acquire to occupy the time he does not spend asleep or at work, that is, some 2,500 to 3,000 hours a year? For example, activities performed in the home certainly require abilities which education can help to broaden.

The economist could derive considerable profit from such an analysis conducted for the benefit of the educationist. To take but one instance, preparation for the proper use of leisure, which should be a leading concern of the teaching profession, can considerably influence the desires and behaviour of the population, i.e. the structure of "national expenditure", hence production too. Here again is a subject for debate between the economist and the educationist, but one which it is for the economist to outline first.

3. DESIRABLE EDUCATIONAL STRUCTURES

The purpose in forecasting the numerical requirements of the economy is to improve the structures of the educational system in the broadest sense. These structures are characterised by three main factors: the number and length of the educational streams, the intake capacity of each, and the bridges for crossing from one to the other. For the first two factors, the structures to be devised may be described as follows:

- at the base of the educational system, as determined by the "upstream realities", namely the distinctive psycho-socio-cultural characteristics conferred upon children by the surroundings in which they grow up;
- at the apex, as determined by the "downstream realities", namely the "numerical requirements of the economy".

The upstream realities will not be dealt with - some countries deny that they exist or fail to take them into account. On the other hand, with the generalisation of secondary and higher education, all countries are agreed that the adolescent must be prepared for the exercise of an occupation before completing his studies. For the first time, a plan for an educational system defining the levels at which this sort of preparation should be organised, was presented in France at the Caen Symposium in 1966. This plan is shown in Graph 2 by two shaded areas: the first (light shade) represents the institutions bridging the way for the rising generations between school and working life, which we have termed the "transitional institutions", and the second (dark shade) represents the portion of the active population improving its status through self-education or by means of up-grading programmes.

The lightly shaded area distinguishes two categories of transitional institution. The first group, administered or supervised directly by the Ministry of Education, are extensions of normal schooling; these are the direct outlets. The second, set up by public and private organisations to train the manpower they need, take in pupils or students who have completed their school education or drop out: these are the "job-training institutions".

The present length of the courses in the transitional institutions varies considerably - from a few months for semi-skilled workers to more than 10 years at higher skill levels (as quite frequently happens in the Arts et Métiers engineering school).

The precise purpose of forecasting the economy's numerical requirements is to calculate the intake capacity needed at each level shown in the two shaded areas of Graph 2. Such computations cover, first, the transitional institutions for the rising generations, be they direct outlets or job-training institutions (light shaded area in the graph: in the event, 2 to 3 million places about 1975); and, secondly, allowing for the contribution which can be expected from self-education, the institutions providing further training for adults (continuous training of job-holders) (darker shaded area). This is the question we shall now proceed to examine.

PART 2

FORECASTING THE ECONOMY'S REQUIREMENTS

Chemical engineers, for example, represent only a negligible fraction of the working population (some 0.05%). Yet were they to disappear the loss would be irreparable, since a chemical engineer cannot be replaced by a mechanical engineer, nor is the converse possible. This is true of most other graduate categories, with the result that the employment of graduates contributes to an equilibrium which involves all economic magnitudes. Future needs of graduates can hence presumably be determined by general analytical and forecasting methods and which are now about to be discussed.

Let us first revert to the four stages of the forecasting process as shown in Graph 1. Stage 1: Forecasting of numerical requirements, as distributed between the educational system and upgrading programmes. It is on this basis that the desirable structures at the various higher levels of the educational system can be determined. Stages 2 and 3: Study of the "content of skill requirements" and of the "cultural complement". Stage 4: Synthesis of educational subjects and planning of sequence of studies throughout the schooling period; preparation of curricula and timetables (1).

In this connection two remarks are called for.

On the one hand, the plan outlined above in four stages is of course highly simplified. Moreover, the object is not to build up an ideal educational system from scratch as might be thought, but to improve the existing system after a step-by-step inventory of all its shortcomings (see below).

On the other hand, up to now the plan will have been only partially applied. In particular, the "cultural complement" has not yet given rise to any explanatory study. And, although the author has drafted an analysis of the content of skill requirements on two previous occasions (in 1956 and 1961), it has not been possible to complete this research.

We shall primarily deal with the forecasting of numerical requirements, the first and by far the most important stage in the process. The second step (content of skill requirements) will be mentioned only incidentally.

---

(1) The subjects cannot be arranged in curriculum form until the structures of the educational system have been planned. The plan, however, will depend in turn on the volume of the subjects to be taught (Graph 1).

The forecasting process may be approached in two ways: directly (section 2) or indirectly (section 3). It is preferable to point out beforehand, however, just what an analysis of present conditions can contribute (section 1). Such an analysis, in any event, will be essential for any study of numerical requirements if either of the two above-mentioned methods of approach are used.

1. DYNAMIC ANALYSIS OF THE PRESENT SITUATION

Events mark a people. Thus the pattern of graduates as distributed among the active population is proof of the errors accumulated as a result of educational policy during the past 50 years - the length of a man's working life. Let us take as an example the table derived from the 1954 census and from various manpower surveys showing such a breakdown. Three sets of facts emerge:

First, education induces in the adolescent a pattern of behaviour which marks him for the rest of his life. The development of technical and vocational training, for example, favours entry into the productive and distributive sectors of material goods and private services. On the contrary, the possession of a lower certificate, of a certificate from a non-technical secondary school, or a university arts degree, arouses a certain distaste for these sectors. The result is a swelling of the civil-service ranks: in 1954, 83 to 84 per cent of the graduates with an arts degree had found employment in the public sector. This trend is not true of arts graduates alone: in this same year, 80 per cent of science graduates were working in the public service or the nationalised sector (of which 60 per cent in the teaching profession).

Secondly, the deficiencies in education exert a deep-rooted influence on the cultural characteristics of the active population. Let us also take an example in this connection. The considerable development of general training and the comparative neglect of technical and vocational training have served only to aggravate the unsatisfactory distribution of graduates throughout the economy. The public sector, though employing but 6 to 7 per cent of the active population, had absorbed 40 per cent of the total number of graduates, whereas the number of graduates which the private sector (employing 93 per cent of the active population) had succeeded in recruiting from the educational system represented only 10 per cent of its total manpower. One operative out of nineteen and one skilled worker out of nine had no certificate from a trade school. In the private sector, two thirds of the skilled clerical personnel could show no evidence of previous vocational training. Agricultural training had been practically non-existent, since 98 per cent of farmers aged 46 and over, who in 1955 were managing 73 per cent of the 2.2 millions farms, had received no instruction in agricultural subjects.

Lastly, the table provides some indication of trends. A breakdown by age group, for example, shows the rate at which any particular disequilibrium in the educational system tends to improve or worsen (1). These trends may be extrapolated over a period of four to five years with a high degree of certainty, if account is taken of flows, which are easy to predict over the short term, from the various educational channels, and of the pupils' dislike or preference for the different types of education available.

An important conclusion to emerge from these three sets of facts, and which does not seem to have occurred to anybody, is that the "dynamic analysis" of a table showing how graduates are distributed throughout the economy enables the primary effects (2) of deficiencies in the training system to be located and data needed to formulate a short-term educational policy can thus be compiled. Perhaps the analysis might even prepare the ground for planning an actual strategy of growth through education, at any rate in regard to occupations requiring but a short period of training (as at job proficiency level), and without the need for constant recourse to the delicate process of indirect forecasting. But for this, local training and employment statistics would have to be kept scrupulously up to date.

2. THE DIRECT FORECASTING METHOD

Every sector of activity has its own "technological environment", namely, its tools of production, methods of operation, stock of skills, as well as its substratum, which in agriculture consists of the amount of farmland and the biological properties of living organisms used in food production (animal and plant life), or in industry of the mineral resources and the physical and mechanical properties of raw materials to be treated or processed. With each technological environment is associated a particular social and occupational group. By this is meant the number of workers employed in each trade and their cultural, social and occupational characteristics, i.e. the knowledge, skills and attitudes they learn in school and in plying their respective trades.

---

(1) Actually, in 1954, the situation was improving in almost all sectors.

(2) Our present state of knowledge makes it practically impossible to quantify the secondary effects, but their impact is bound to be heavy. The pressure exerted by each individual on economic and social development is determined by what he has learnt rather than by what is desirable for the whole community. At the level of the population as a whole, the pressure finally becomes strong enough to delay the rate of development to an appreciable extent.

Between these two factors (the technological and occupational aspects of environment) a dialectical process is set in motion by education, constituting a release mechanism triggering man's capacity to act. This capacity will be so applied as to change the technological environment, which in turn will compel the social and occupational environment to become adjusted. Man's efforts to learn will accordingly be all the more intensive and sustained as growth becomes more rapid. Forecasting operations will thereupon follow the pattern shown in Graph 3.

A sector of the economy increases its production (1 in the Graph 3). Its technological environment develops and changes. A certain link (a) is formed between (2) and (1). In turn, changes in the technological environment exert a dual influence on the relevant social and occupational environment (3): in some sectors, the number of persons employed will increase and in others decline, causing a continuously changing pattern of the active population as distributed between economic sectors, trades, regions, etc. At the same time, the proportion of people employed in the different types of trades so changes as to benefit the highest levels of the occupational hierarchy, while the content of the job skills accordingly required also undergoes a change. There are also links (b) joining (2) to (3), etc. If the future nature and value of the relationships (a), (b), (c) - can be assessed in the light of past experience, it will be possible to proceed from 1 to 2, then from 2 to 3, and finally from 3 to 4. If the skilled manpower resources which the academic authorities (5) (1) have planned to provide fail to meet the computed numerical requirements (4), and if the content of skills acquired through education differ from the content required for actual performance of the job, anticipated levels of output will not be reached. In that event a new estimated growth rate below the previous one must be computed by using the relationships (d), which express the decline in productivity in terms of educational deficiencies (6). The sequence of operations is then resumed on this new basis (II in the graph). The development which accompanies Graphs 1 and 3 and the description of the direct method constitute an excellent approach in analysing the indirect method, which must be dealt with in greater detail.

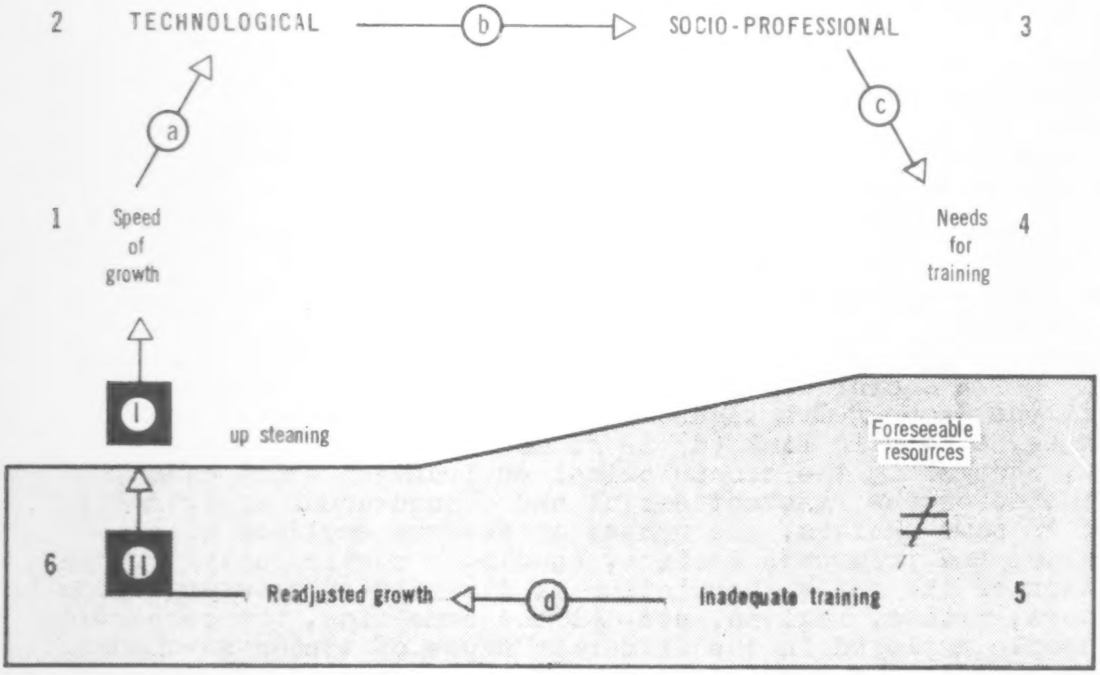
---

(1) Education of rising generations and upgrading of workers.

Graph 3

DIRECT FORECASTING OF THE NEEDS FOR TRAINING

DEVELOPMENT OF SOCIO-PROFESSIONAL STRATA


2
TECHNOLOGICAL
b
SOCIO-PROFESSIONAL
3
a
c
1
Speed of growth
Needs for training
4
I
up steaning
Foreseeable resources
≠
6
II
Readjusted growth
d
Inadequate training
5

3. THE INDIRECT FORECASTING METHOD

Because of the very slight importance attached to the study of technological environment and the fact that economists have allowed their interest to be centred mainly on figures showing past trends, the field of application of the direct forecasting process has been considerably narrowed. Instead of dealing simultaneously with all the factors to be taken into consideration, whether at the outset in order to draw up an initial outline of foreseeable trends as a whole, or at each stage of the forecast in order to equate the various components, the indirect process of forecasting treats them one after the other. Since the purpose is to skirt obstacles along the way, results can ultimately be reached only by a roundabout route. But such obstacles persist, and they are many. Thus little or nothing is known of certain aspects of the initial situation - the starting point of the forecast. The relationships which govern the equilibrium of economic magnitudes in a growing economy (notably the factors which in future will modify past trends) must largely be dealt with from scratch. Since the indirect process offers the wrong kind of framework for analysing these difficulties, which must at all events be resolved if results are to be obtained, we shall see that it cannot be used in its pure state.

Three categories of data are applied in this process, namely:

- "tables of economic magnitudes", denoting hhe initial situations to be projected;
- "tables of interdependency relationships", governing trends in these magnitudes;
- lastly, the various policy measures that may suitably be adopted.

When all such data are used, the forecasting process is "active". By combining in different ways the components of the various economic, social and cultural policy approaches that might be selected, the cost of each combination and the results each can be expected to yield are ascertained. Since as wide a range of solutions as may be desired is offered, the choices can be clarified and hence be determined with greater awareness. We shall confine ourselves to the study, already quite complicated enough, or an "unbiased" (1) forecast, which utilises only the first two sets of data, i.e. the economic magnitudes and their interdependency relationships. Before analysing these two types of data, it will be well to describe the indirect procedure.

---

(1) In actual fact, we shall see that a forecast can never be altogether unbiased.

a) Overall view of the process

Let us begin with a general outline:

1. Description of the outline. Graph 4, which gives a simplified version of the process, is composed of rectangles and two sets of circles. The rectangles represent the tables of economic magnitudes expressed in absolute values. Arranged in proper sequence, each of these tables denotes an aspect of the initial situation to be projected. The circles containing the letters a, b, c, d, e, represent the interdependency tables, each of which links the table of magnitudes following it to the one preceding it. The circles containing the other letters denote the modifying factors which in future will influence relationships a, b, c, d, e... drawn from past experience. It will be observed that the only modifying factors included in the graph are i, j, k, l...., i.e. those likely to modify the growth rate of labour productivity, that is, former values of (a). The factors which may have a bearing on b, c, d, e, ... were directly introduced in 1962 into the future values these relationships are most likely to assume (we shall see how later).

Let us first examine the case in a . Labour productivity a in each sector of the economy evolves over time (generally very slowly) under theinfluence of the factors which modify the effectiveness either of the technological environment (case of factors i) or of the relevant social and occupational environment (case of factors j, k, l....). It is these modifications as compared with past trends which in point of fact must be defined.

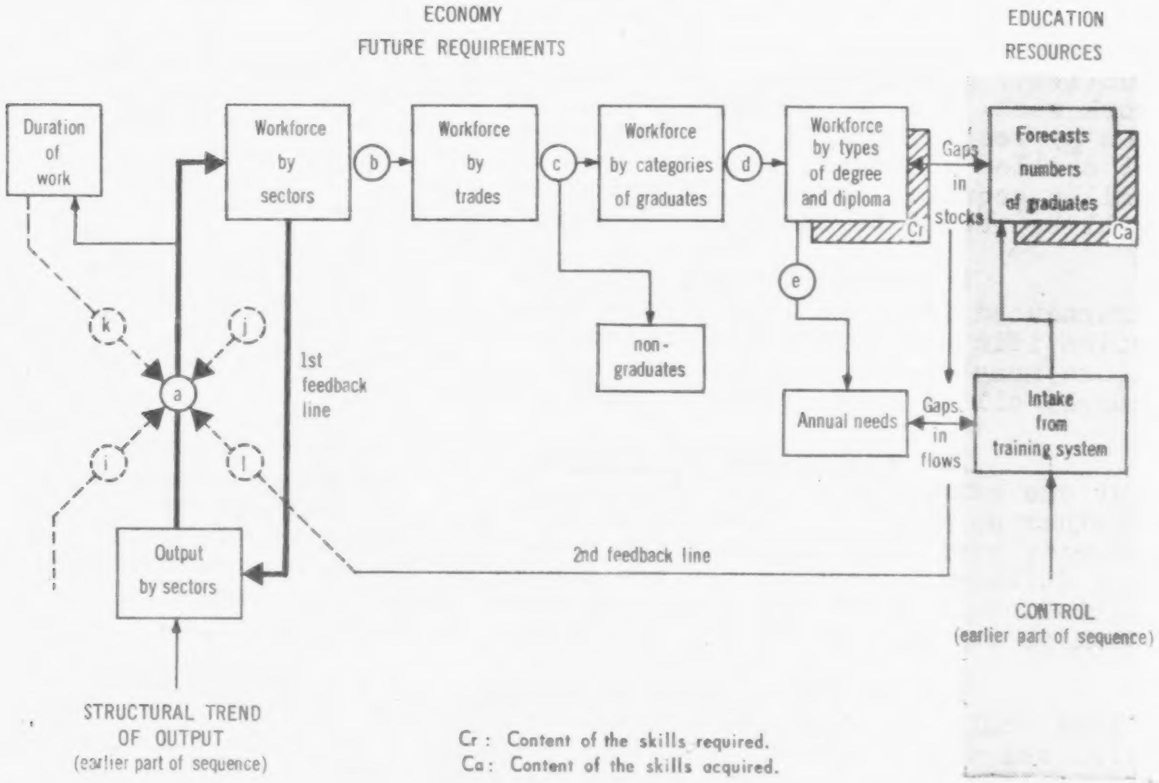
The i factors measure the changes which investment, in the broadest sense of the word, can introduce into the effectiveness of a particular technological environment and consequently of labour productivity a . Investment may become greater or smaller in volume but also more or less effective in quality. To quantify the influence of these probable changes, we must turn to the various components which go to make up the particular technological environment (see above). Research, for example, which is a form of investment, has an impact on the effectiveness of farm machinery and farmland, of the biological properties of living organisms used for the production of food and of the physical and mechanical characteristics of materials treated or processed by industry, etc. There can of course be no question of rigidly quantifying the foreseeable effects of all the many modifying factors in every sector. It will be enough to assess their overall influence by attempting to determine the many reasons for which values of (a) will be greater or less than in the past. It is thus manifestly necessary from the outset to introduce methods normally used in the direct forecasting process into the indirect process as well. Yet this need is seldom perceived by economists.

Graph 4

INDIRECT FORECASTING PROCESS

(Physical economy)

END OF A SEQUENCE OF OPERATIONS


ECONOMY
FUTURE REQUIREMENTS
EDUCATION
RESOURCES
Duration of work
Workforce by sectors
b
Workforce by trades
c
Workforce by categories of graduates
d
Workforce by types of degree and diploma
Cr
Gaps in stocks
Forecasts numbers of graduates
Ca
non-graduates
e
Annual needs
Gaps in flows
Intake from training system
k
j
a
i
l
1st feedback line
2nd feedback line
Output by sectors
STRUCTURAL TREND OF OUTPUT
(earlier part of sequence)
CONTROL
(earlier part of sequence)

Cr : Content of the skills required.
Ca : Content of the skills acquired.

Factors j, k, l.... have an effect on the social and occupational environment, hence on the a values. For instance the (j) factors measure the impact any deterioration or improvement in the social climate should have on (a). Considerable productivity gains have thus been observed in some industries when the reins have been handed over to a younger, more progressive management team (1). The k factors denote the productivity gains arising, for example, from a reduction in the work week. The l factors assess the foreseeable effects (on a) resulting from an increase or decrease in the shortage of skilled manpower, from the rise or fall in the content of skills acquired through education compared with those which will be needed to exercise an occupation or profession, etc.(2).

For want of time, only the k and l factors were introduced into the 1962 study. In spite of its apparently scientific character, the indirect method of forecasting overlooks many factors at the very core of the mechanics of growth, nearly all of whose secrets still remain intact.

2. Mechanisms of forecasting. Graph 4 illustrates but one extremity in the sequence of measurement operations. Farther up the line (that is in II') a successful attempt has already been made to determine what the structural trend in the different economic sectors should be during the forecasting period. This trend has been introduced into the process in the form of curves lacking any definite time pattern.

Let us now attempt to visualise a projection for the first table of magnitudes characterising the initial situation, i.e. the table showing output by sectors. This table will be subjected to the constraints of the structural trend over an unspecified time span. The set of sector-productivity relationships a (3) leads on to the next table of sector manpower resources. The balance between these two tables of magnitudes is determined by the trial-and error method. It is assumed that growth of production should take on a certain value. But the first trial conducted on this basis is never quite accurate. What then usually happens is that the workforce found to exist in the various sectors at the horizon date is either bigger or smaller than the total number of people likely to be looking for work. The plus or minus difference is reduced by successive approximations and iteration. For this purpose the first feedback line is gone over as often as necessary. When the gap is dosed, the calculated rate of growth corresponds to full employment of the labour force. The operations can then be carried onward to the next stage (1).

---

(1) At the same time, there is almost always either virtual technological revolution or a sharp fall in sales inducing a chain of mergers.

(2) Even if the area to be attributed to each modifying factor can be circumscribed, it is difficult to isolate the influence it may have on (a) when other factors also come into play, often from a different direction. It is all the more necessary that these difficulties be tackled.

(3) Productivity relationships are expressed in terms of time saved per unit produced, thus making them and other relationships homogeneous.

In turn, the sector workforce table, through "occupational skill relationships" b , leads into the table showing the distribution of the workforce by trade or occupation. Succeeding operations are carried out in the same way. By using the "university qualifications" set of relationships c , the table farther along, which breaks down the workforce in each occupation into non-graduates and graduates by broad degree categories, is projected. Stemming from the latter are the "university specialisation relationships" d and the table breaking down each degree category according to specialisation.

The difference between the figures at the end and beginning of the forecast period measures the increase in the number of graduates in the various specialisations which should normally be required for economic growth.

The second sequence of operations under the heading of "Education" in the graph need not be described here. If losses due to retirement and mortality and gains flowing in from various training systems are taken into consideration, an estimate is obtained of the future numbers of graduates which will be available. If it appears that, whatever steps are taken, differences in stocks or flows (or perhaps in both) will persist throughout the forecast period, then the initially calculated rate of productivity growth a will not be reached. All the figures must then be recomputed, whence the "second feedback line" allowing for the modifying factors 1 which, in our example, tend to slow down the rate of economic expansion. In actual fact, such feedback operations make use of all the productivity modifiers which were referred to earlier.

---

(1) These operations must obviously be done by computer particularly as, at the "duration of work" and "workforce by sector" levels of tabulation, various trial elements of social policy must be introduced into the calculations.

We hoped eventually to be able to introduce into the forecasting process an analysis of the content of the skills required (C_r in the graph) for purposes of comparison with the content of the skills acquired through education (C_a), and thus be able to determine how the rate of growth was affected. Although the model for such a type of forecast was prepared and some of the relevant data collected in 1956 and 1961, the work has not gone beyond this point.

Once the numerical requirements of the economy have been computed and the probable graduate resources determined, the conditions under which these resources can be controlled by the flows from the various channels of the educational system can be laid down. Previous material communicated on this subject in 1959 at the Conference held in the Hague, with particular reference to the laws of equilibrium governing supply and demand, must here be reviewed (see the report: "Forecasting Manpower Needs for the Age of Science", page 72). It may however be pointed out that the graph shown on page 73 of this latter report is theoretical in character. The planning of intakes (at national and school levels) should be more in keeping the definition of shortages and surpluses of skilled personnel, graduate and non-graduate, laid down as a result of the international survey launched by the O.E.C.D. in 1960 (see page 186, paragraph 636 of the report: "Resources of scientific and technical personnel in the O.E.C.D. area"). It is evident that a shortage or a surplus of graduates cannot be likened to a shortage or surplus of liquid in watertight, rigid containers. Account must be taken of the extraordinary adaptability of man to his surroundings and the flexibility of the economy, which invariably adjusts in some degree to educational deficiencies. But these are always bound to have serious consequences (notably on the factors modifying productivity trends), thus justifying the computation of surpluses and shortages.

b) Economic magnitudes (static forces): initial situation

According to Graph 4, the forecasting process leading to the formulation of an education policy consists in passing:

- from the economy to the occupation (through employment, i.e. hours worked per year and total number of the active population);
- from the occupation to the educational system (through the number of graduates in employment classified by broad categories, and finally through these broken down by specialisation).

In sum, a bridge must be built between the economy and education. If this bridge is to be crossed in both directions, four conditions must be fulfilled: 1. All the arches of the bridge (i.e. the tables of magnitudes defining the initial situation) must be built; there can be no gap in the line;

2. To each figure of a table must correspond a figure in the one before and after it, so that in proceeding from one to the other no obstacle is met. 3. In addition, the bridge must lead to the various institutions whose object is to educate the generations on their way up and to train the active population. To enable this junction to be made, the table for graduates in employment by specialisation (the last component in the sequence computing requirements) must be constructed for the same period and with the same frame of reference as the table of educational institutions, which is no easy undertaking. This is because the first of these two tables refers to the past (the oldest graduates obtained their qualifications before the First World War), while the second table refers to the present and to some extent to the future, since in evaluating future resources in graduate personnel, account must be taken of any reform schemes by the academic authorities sufficiently advanced to warrant consideration. 4. Lastly, because of the complexity of the computations, and the number of the tables showing magnitudes, these must be simple, indicative and balanced, and as few variables as possible must be used. Not only must any parasitic variables have been eliminated, but those finally selected must be classified in the order in which the problems will be tackled. To assign a dominant position to a variable when it should be subservient may render impossible a solution to a problem. This will explain why it is generally more difficult to rework older, poorly compiled statistics within a coherent framework than to build up a fresh table of magnitudes from inadequate, unreliable and scattered data. The main obstacle to the development of analysis and research is the unsatisfactory co-ordination of statistical information.

Some of the problems will briefly be described by means of an example showing how one of the tables introduced at the final stage of the forecasting process is prepared and compiled. The proposed example may perhaps be applicable only in France. Individual countries must each find the solution most consistent with the statistical data most easily possible to build up.

In 1956, neither the number of engineers nor their distribution among the various economic sectors according to speciality was known. The first step was to conduct a survey of schools (1) and school departments which provide, or used to provide, engineering training. There were then 126 (they are now more numerous). With the help of the schools' yearbooks, alumni were distributed, after eliminating those holding more than one engineering degree (1) over the 126 columns of a 35-row table; 13 of these rows were for the various economic sectors in metropolitan France.

---

(1) A number of schools have closed since 1934 or now limit their training to technicians, but as the engineers earlier trained by them are still active they had to be taken into account.

There could be no question of introducing into the forecasting process a 4,400-box table for engineers parallelling the tables for graduates. Schools and school departments were accordingly so regrouped as to enable the forecast results, once obtained, to be easily broken down and expressed in the form of intake programmes for each separate school.

1. Objective criteria for classifying graduate engineers. The breakdown of former engineering school students by sector of the metropolitan economy (in the table containing 4,400 boxes) shows the existence of a remarkable pattern. Each school has a characteristic "distribution profile" which makes it immediately recognisable from the others. Most Arts et Métiers graduates, for example, are employed in the metallurgical sector, notably in mechanical engineering, and have therefore been classified in the "mechanical engineering" rather than "general engineering" group (the classification used in university statistics). The chemical engineers, half of whom are employed in the chemical industry, of course belong to the "chemical engineering" group. These are simple examples, but in many cases, a school cannot be classified until its profile is known. Schools whose profile is balanced, i.e. largely comparable to the average profile for all the schools combined, have been classified under the "general engineering" group. Analysis of the profiles in 1956 thus revealed the existence of ten standard profiles, hence of ten "engineering

---

(1) "Double-graduates" are eliminated in a given order and as determined by objective criteria (which are explained a little later on). To reply to the international survey conducted by the O.E.C.D. in 1961 we had to eliminate a vast succession of such graduates. A special study should be made of this complex problem in view of its importance.

training groups" (1). The use of objective classification criteria that can be thoroughly checked helps to avoid any confusion apt to be caused by the adoption of subjective criteria - confusion which may often prevent the statistics from being used at all.

2. Significance of the table. After the schools had been reclassified in "groups", a very simple table could be drawn up (see Table below):

Let us take a figure in this table. At one and the same time it will be in a column, that of the chemical engineering group, for example, and in a line, that of the chemical industry, which alone accounts for 50 per cent of the total number of chemical engineers listed in the column. The significance of the figure is therefore twofold: academic, or let us say educational, since it refers to a training group, as well as economic, since it refers to a particular sector of activity. But the chemical industry also employs engineers from all the other training groups, such as, in decreasing order of numbers, general engineers, mechanical engineers, agricultural specialists, agronomists, etc. The presence of the last two may seem unusual, but is easily explained by the fact that fertilisers, pharmaceutical and other products are manufactured and sold by the chemical industry, thus requiring the skills which this type of engineer possesses. In short, the ten engineering groups "combine", in varying proportion according to group, to produce goods in the chemicals sector. Hence the term "group Combinations" has been used to cover the various categories of engineers

---

(1) At this time engineers of an entirely new type were already appearing on the scene; there were so few, however, (some dozens) that they were classified as "general engineers", of which they probably also had the characteristics.

Important: With 120 schools and specialised school departments, the number of groups will in some measure depend on how the economy is divided up into sectors. Yet it is doubtful whether more than ten groups could be distinguished by further breaking down the sectors unless account were taken of groups containing unusually small numbers and so far possessing no very clearcut features. This shows how necessary it is, when drawing up nomenclatures, to look for all possible links between such widely different categories as the structure of the economy (first table in the process: Graph 4) and the distinctive characteristics of graduate engineers (last table in the process).

TOTAL NUMBERS OF ENGINEERS

Breakdown by training groups and by group combinations

(Initial situation - Year 1955)

Simplified table(1)

Group "combinations"	Row No.	Training Groups										
		Agricultural Engineers	Mechanical Engineers	Electrical Engineers	Chemical Engineers	Prospecting and Mining Engineers	Civil Engineers	Textile Engineers	Engineers in Miscellaneous Industries	General Engineers	Technical Government Engineers	Totals
Column No. →	↓	1	2	3	4	5	6	7	8	9	10	11
I. NOT YET IN EMPLOYMENT	1											
1. Engineering students	2											
2. Engineers on military service	7	740	1,000	1,400	500	240	620	60	10	680		5,250
II. IN EMPLOYMENT	8	16,310	25,910	25,780	13,650	4,430	8,260	2,950	990	16,470	5,500	120,250
A. Metropolitan France	9	12,700	23,580	23,980	12,430	3,450	6,500	2,655	770	14,955	5,500	106,530
0. Agriculture	10	5,420	780	215	460	20	45	25	5	510	-	7,480
1. Fuel and Power	11	90	1,295	3,690	645	1,230	145	10	-	1,735	-	8,840
2. Transport	12	65	1,700	1,245	50	115	275	-	10	1,225	-	4,685
3. Civil Engineering & Building	13	65	1,720	2,135	175	160	2,485	15	-	1,255	-	8,010
4. Metallurgy	14	380	13,110	10,815	1,270	1,020	385	125	60	5,320	-	32,485
5. Chemicals	15	700	1,085	815	5,670	250	45	95	-	1,345	-	10,005
6. Textiles and Leather	16	65	470	240	1,490	20	20	2,250	-	345	-	4,900
7. Miscellaneous Industries	17	180	425	1,415	210	35	50	75	655	420	-	3,465
8. Private Services	18	1,550	495	1,125	585	160	600	55	5	2,065	-	6,640
9. Public Services	19	4,185	2,500	2,285	1,875	440	2,450	15	35	735	5,500(2)	20,020
B. Outside Metropolitan France	20	3,610	2,330	1,800	1,220	980	1,760	285	220	1,515	-	13,720
1. Foreign countries	21	450	750	670	870	440	680	265	165	575	-	4,865
2. Franc-Area countries (total)	22	3,160	1,580	1,130	350	540	1,080	20	55	940	-	8,855
III. ON PENSION AND RETIRED	27	1,650	2,590	2,320	1,350	430	620	350	60	1,650	-	11,020
IV. GRAND TOTAL	28	18,700	29,500	29,500	15,500	5,100	9,500	3,360	1,060	18,800	5,500	136,520

---

(1) Neither the five rows for student-engineers nor the four rows for the franc-area are included.

(2) Special category of engineers not trained in a school but holding the title and exercising the duties.

employed in the chemicals sector. There are as many group combinations as sectors, i.e. as rows, and the composition of each group combination, or its "profile" we might say, is one of the basic characteristics of the sector to which the combination belongs.

What significance can now be derived from the combination of rows and columns, and, with more accurate results, from the groups and group combinations? The answer which immediately comes to mind lies between two poles. On one side, schools are set up, increase their intake capacity and diversify with the appearance and development of new sciences and new scientific applications. This trend can quite readily be observed over a long period in the past (1), and serves to identify the major landmarks throughout industrial civilisation. On the other side, while new additions are made to the engineering groups (columns), each group combination (lines) contributes to the changes in its technological environment at the same time as it has adapted itself to them. These two major lines of approach (the group and the group combinations) point the way, as we shall see, towards the exploration of the future.

3. Optimum dimensions and possibilities of the table. The argument, up to now, has been confined to engineers among the active population in metropolitan France, that is, to the two first dimensions of the table, i.e. the educational dimension(11 columns) and the economic dimension (11 rows: from 9 to 19). In actual fact there are not 11 but 28 lines, since the table includes two other dimensions.

This arrangement is the best compromise between conflicting necessities and leaves the way open for all possibilities of subsequent growth. This we shall attempt to show by successively reviewing the four dimensions of the table.

Educational dimensions: Ten groups (eleven columns if the totals column is included). A larger number of groups would have made the job of calculating much too heavy without offering any appreciable advantage in return. With fewer than ten groups, the forecasting operations would have been more delicate and planning the intake from individual schools much more difficult.

Economic dimension: Ten sectors (eleven rows including that for the totals). It would perhaps have been desirable to show some sectoral branch whose remarkable development and distinctive characteristics are deserving of special analysis.

---

(1) Two centuries ago, there was only one engineering group. Today there are at least ten.

But to have done so would have burdened the forecasting operations out of all proportion to any advantages this might yield. We shall see that determination of the relationships (d) often requires the internal structure of a sector to be investigated, as when the presence is noted of engineers holding an unrelated type of degree (see above).

Demographic dimension: Seven age groups (nine rows including that for the totals). With seven age groups, we can already obtain a satisfactory view of the flow of generations of engineers passing through: the engineering schools (four rows for student-engineers, one for each graduating class); military service (one row); working life (one row), and finally reaching retirement (one row). There is justification in the four rows for the schools (1). It may, perhaps be argued that it would have been useful (in the case of a five to ten year forecast) to use about ten rows for those reaching the apex of the age pyramid, a period of working life when the mortality rate is high and the age of retirement begins. But this would have meant introducing about a hundred additional boxes into the table, whereas the problem is actually an accessory one which can be studied separately.

Geographical dimension: Six territorial areas (eight rows with those for the totals). Only one heading has been kept for metropolitan France, since the labour market for engineers is a national one and a forecast of requirements for the economy as a whole is sufficient. It may be considered unnecessary to use as many as five divisions for the tenth of the engineering graduate force which is employed abroad. These divisions refer to foreign countries, to Algeria, Tunisia and Morocco as well as to the former overseas territories, including those of Africa and Indochina. The explanation is simple. It is due first of all to necessities created by circumstance. In 1956 a close count had to be made of the successive waves of engineers flowing back to France (most of the engineers who worked in Indochina had already returned). To this first reason must be added a second of a general nature: in view of the size of the labour market abroad (11 per cent of engineers were working outside metropolitan France), especially for graduates from certain types of schools, its features had to be known in order to orient the forecasting operations. The 1956 study showed that the breakdown profile of active engineers outside France was markedly different from the metropolitan profile, the reason being that the structure of the engineer category, hence also of "training requirements", denotes a certain level of material civilisation.

---

(1) But each school should possess a table giving a geographical and sector breakdown of its alumni. By means of this table, it would be easy to compile another, for use by the regional planning authorities, showing the regional breakdown of engineers by group and sector. This would be invaluable, especially if kept constantly up to date, since most of the other economic magnitudes can be understood once the engineering picture is clear i.e. the enterprise and production patterns, numbers of workers employed, etc.

It was not, therefore, possible to devise any simpler or more indicative presentation of an initial situation. With the four dimensions thus represented, its 11 columns (one for the totals) and its 28 rows (seven for totals), i.e. with its 308 boxes (of which 210 were to be used in the forecasting process), this table is exactly tailored to the problems which existed in 1956. It was not considered desirable to increase or to reduce the number of headings, particularly as subsequent development possibilities were allowed for consistently by all the dimensions in the table, in accordance with what we designated as an "optimum size".

c) Interdependency relationships (dynamic forces): first step into the future

Interdependency relationships can be determined only when the tables of magnitude have been compiled and must depend on the internal structure of these tables, since the purpose of the relationships is to set the future trend for all such magnitudes (see above).

Let us first examine the properties of interdependencies and the methods for their calculation. We shall then make some general remarks concerning the proper blending of calculation and consultation for analytical and forecasting purposes.

1. Twofold property. The relationships are elastic in the short term, but also mark a trend over the long term. The productivity rate for labour (a) thus increases appreciably when the production rate accelerates, only to fall back immediately to a low level as soon as the rate of expansion declines, since employment in relation to fluctuations in production always follows behind. The elasticity curves for productivity can, therefore, be drawn for the immediate past in terms of variations in production. On the other hand, as a result of an innovation, for example, substantial potential reserves of productivity can be accumulated. The mobilisation of these reserves, under the stimulus of various influences, for many years to come will maintain high productivity rates which may

reach 15 per cent in some sectors (1). But once the reserves are exhausted, they can be rebuilt only slowly. The productivity growth rate will then gradually fall from 15 to about 5 per cent, for instance. Here, first with acceleration, then a deceleration effect, we again have the influence on (a) of the trend-determining factors (i), (j), (k), (l) mentioned in Graph 4.

The interdependency relationships a, b, c, d, should, therefore, be introduced into the forecasting process (Graph 4) in the form of elasticity curves. As these curves are subject to modifying factors which also should be introduced into the calculations, they will tend to become distorted as time goes on, while their position shifts within the graph. Unfortunately, matters are not so simple. Three types of situation are to be found:

- The sources of information concerning past events exist and are adequate. This is the case for productivity relationships (a), at least in so far as most sectors of the industrial economy are concerned. Elasticity curves can then be plotted under fairly satisfactory conditions, subject to certain reservations. In any case, the curves cannot be projected into the future unless account is taken of the modifying factors. These, however, have not been studied, and cannot be unless recourse is had to the direct forecasting method.

- The sources of information exist but are inadequate because the time-span is too remote; this is the case of skill relationships (b). Fixed values are accordingly calculated for the past irrespective of the growth rate but, just as for the (a) relationships, the projection of these coefficients necessarily requires consideration of the modifying factors, whereas we have no information enabling them to be objectively assessed. Here again, recourse can but be had to the direct forecasting method.

- Lastly, no sources of information exist, as in the case of (c) and (d), i.e. the university qualification and specialisation relationships. These however we can do without, since if complete statistical series were available for the past, they would give a wrong picture of the demand trend for graduates, for the simple reason that educational policy has never been based on these requirements. Relationships (c) (d) must accordingly be constructed from scratch to meet future needs, without reference to the past.

---

(1) A 15 per cent - and sometimes even higher growth rate - over many years is true only of narrow sectors of the economy. As the field of observation is extended over wider areas, the rate declines and its fluctuations diminish.

We shall deal more particularly with this third category of situation (where information is practically non-existent) and with the relationships (d), located at the last stage the requirements forecast, thus paving the way towards a study of the content of the skills required.

2. Methods of calculation. The relationships (d) are determined row by row from the table showing the breakdown of graduates according to specialisation, and for each box in the row. Problems differ from one row to another but, as a rule, two lines of approach combining calculation and consultation can be used: employment analysis and economic analysis:

Employment analysis. A "group combination" of engineers (row) is the result of a slow accumulation of intakes from the ten training groups, going back some forty years. The composition of these intakes has yearly undergone structural changes, as shown by a rapid analysis of the alumni yearbooks. This is why the profile showing the distribution throughout the economy of the engineers graduating during the past four or five years is markedly different from the average profile drawn up in order to classify each school within an individual training group. Such differences in profile prompt an investigation into causes (a question which will be dealt with shortly) (1). The information thus collected is then compared with the composition of job vacancies which certain schools or alumni associations are accustomed to record very carefully. An initial idea can then be gained of the value which should be assigned to the ten (d) relationships for each of the thirteen sectors of the metropolitan economy and for each group of foreign countries taken into account. Economic analysis will help to clarify this idea.

Economic analysis. The relative trend of an economic sector's requirements for engineers classified by specialisation can often be ascertained by analysing the sector in question. For example, the demand of the chemical sector for engineers specialising in agriculture would rapidly grow were the pharmaceutical and fertiliser industries belonging to the sector substantially to increase the volume of their production and sales. This analysis will in turn be supplemented by a study of the threefold effect on requirements caused by relations with customers and suppliers, and the human relationships which ensue. The mere fact that the chemicals sector specialises in the sale of intermediate goods in rapidly increasing quantities, that is, in goods which other industries must consume or process, suggests that the chemical engineering group will gradually extend its dominance over the customer sectors. This indeed is what has happened in the textile industry, where the chemical engineers have gradually driven out the textile engineers. In order to survive, those of the textile engineering schools which have not closed their doors or fallen back on the training of technicians, have had to reorganise their syllabuses.

---

(1) If, instead of increasing the number of yearbook surveys, as we had to do in 1956 owing to lack of time, the subject had been exhaustively covered, the composition of the engineer force over the next forty years (i.e. about the year 2000) could have been accurately described, assuming that the factors determining trends in the size and structure of the force remained the same as between, say, 1950 and 1955.

Constraints to achieve consistency. The university qualification relationships (c) have made it possible to calculate by broad category the increase in the demand for graduates, for example, the requirements in each sector for all types of specialised engineers. It will be remembered that the composition according to specialisation of the engineering force employed in each sector at the time of forecasting is known, as shown in the final table describing the initial situation (Graph 4). This composition is apt to change however during the forecast period. Foreseeable requirements in any specialised branch may grow more quickly, or more slowly, than for the sector as a whole. The purpose in analysing both employment and economic patterns is precisely to define variations in density, first approximately in the form of the ten specialisation relationships (d) for each sector (since ten training groups were adopted for graduate engineers). The final values can be determined with relative ease. By applying relationships (d) to the final table showing the initial situation it should be possible to ascertain the total number of engineers, combining every specialisation, which will be needed at the date for which the forecast was made, a number computed earlier by means of the (c) relationships. Any discrepancies can be absorbed by successive approximations, taking each initially estimated relationship (d) in turn. The margin of choice left in these adjustment operations is all the narrower since in each sector there are one or two training groups whose numbers are proportionately large. As long as a few values out of the ten to be computed for the sector can be relied upon, the others can be accepted with a fair degree of confidence.

3. Blending calculation with consultation. Owing to the enormous gaps in documentation, the extent of the areas still unexplored, and the rudimentary character of the forecasting methods - which this brief study has merely outlined - the comments which follow have a general interest which goes far beyond the methodology of calculating the interdependency relationships. Consultation provides information which is absolutely essential and which make it possible to go further

than anything that can be obtained by the indirect method of forecasting with just the aid of available data. Calculation and consultation procedures are combined at all stages of the analysis to develop existing information, improve methods, extend the field of investigation to new areas, check results, etc.

A number of conditions are necessary to make consultation effective. Below are some of them:

- Using the information already available and basing procedure on the experience yielded by former studies, a tentative forecasting outline should be drawn up. At the same time all gaps and obscure points should be recorded and classified, beginning with those whose solution will help to clarify the others. This initial outline will be progressively revised during the consultations.

- A list of contacts to be made should be drawn up in the order in which the expected results will complement and cross-check one another. The contact's interest will be aroused only to the extent that the information already collected and a broadened approach to the problems are able to teach him as much as he imparts. The conversation should be limited to those points which the contact appears capable of amplifying (which may not necessarily be those it is desired to deal with). All written material relevant to the subject, and if necessary the names of people who can help to supplement information already gathered, should be obtained.

- The original plan should be progressively revised, and any discrepancies and gaps should be noted. These will be the subject of a second round of rapid consultations, also in a predetermined order. The work will be completed when the outline is sufficiently coherent and all sources of written and oral information have presumably been tapped. The forecasting study can thereupon be set up in preparation for the calculationsproviding the answers.

After each contact and at the end of each stage in the process, it will be well to assess the technique of consultation used, since a maximum amount of serviceable information must be obtained from the greatest number of people in a minimum amount of time.

THE DEMAND FOR UNIVERSITY TRAINED ENGINEERS IN THE NETHERLANDS

by
R. RUITER

CONTENTS

I. General
II. Employment per branch of industry
III. Density of engineers
IV. Number of engineers and production
V. Number of engineers and investment
VI. Forecast
VII. Confrontation of demand and supply
VIII. College engineers
IX. Graduates of the faculty of mathematics and sciences
X. Summary and conclusions.

I. GENERAL

A study of future demand for and supply of engineers was undertaken in order to get a global idea of required expansion of educational facilities in engineering education and to judge whether creation of a fourth university of technology was necessary.

The demand for engineers was defined as the number of jobs which, given the job descriptions, should be filled by university trained engineers taking into account the level and type of training they receive. This definition suggests that it was assumed impossible to assess the demand for engineers correctly; it seemed possible to indicate orders of magnitude only.

There is, however, no statistical information on the number of engineers' jobs as defined above. Therefore analysis of past development of the demand for engineers has to be based on the number of engineers actually employed. As this number is almost entirely determined by the supply of graduates in past years it was necessary to judge if the numbers of engineers available were sufficient to match demand. This judgment introduces an arbitrary element in the forecasts.

Comparison between countries, branches of industry and individual firms suggests that demand for engineers is determined by a number of interrelated factors such as the pattern of production, technological development, organisation of production (i.a. the size of firms etc.). The demand for engineers can be assessed by seemingly different methods if only one of these factors is taken into account at a time. The interrelation between the factors makes that the outcomes of the various methods do not (need to) differ.

The most recent assessment of the demand for engineers assumes that a reasonable estimate can be made by taking into account the growth of total employment, its distribution over the various branches of industry and a trendlike increase in the density of engineers (number of engineers as a percentage of total employment) per branch of industry. These three factors represent respectively the demographic, the economic and the technological development. It was tried to analyse the engineers' density by comparing it with economic indicators such as the increase in productivity and investment per branch of industry.

The outcomes of the forecasts i.e. the total of the outcomes of the various branches of industry have been checked by using the global relation between number of engineers and total volume of production (G.N.P.) which can be noticed over a long period.

The demand forecast has been confronted with the outcomes of a supply forecast. This comparison suggests that existing shortages will continue.

The assessment of the demand for engineers was made without taking into account simultaneously the development in supply and demand of other categories of skilled personnel. This does not seem justified. One even could argue that a forecast for a specific category of personnel is only possible as part of a forecast which covers all kinds of skilled workers. This approach, however, requires comprehensive statistical information which was not available. A compromise was found by taking into account those categories which can be regarded either as competitive or complementary with respect to training and jobs occupied. Those groups are especially college engineers and graduates of the faculty of mathematics and sciences. Past and future supply of these categories have been compared with that of engineers.

The variations in the ratio of college engineers to university trained engineers suggests that composition of technical cadre is flexible and that therefore the demand for university engineers does not need correction. The expected increase in the number of graduates of the faculty of mathematics and sciences indicates greater possibilities of substituting engineers for science graduates. Thus removing the shortages of engineers.

In this approach the demand for engineers only was studied. The method applied can be seen, however, as a special case of a general model.

II. EMPLOYMENT PER BRANCH OF INDUSTRY

Table 1 shows past and expected development in employment per branch of industry. The figures for 1970 are based on an exhaustive analysis of future possible economic expansion; those for 1975 and 1980 were found by extrapolation. When the outcomes of the forecast are compared with the figures of the past then it turns out that it is assumed that existing tendencies will have to continue. An exception to this rule is found, for well known reasons, for the development in mining, chemicals and petroleum.

Table 1. EMPLOYMENT PER BRANCH OF INDUSTRY (x 1000)

	1951	1955	1960	1965	1970	1975	1980
Agriculture	538	506	442	371	325	290	255
Mining, chemicals, petroleum	107	124	131	136	135	135	135
Food, tobacco, etc.	219	213	215	216	220	220	220
Textiles, footwear	282	270	251	253	250	245	235
Paper	22	23	26	32	35	40	40
Basic metals, machinery	157	180	194	230	250	275	300
Electrical machinery and apparatus	104	126	155	188	210	230	255
Transport equipment	107	119	125	128	135	135	135
Miscellaneous industries	242	247	258	273	290	305	320
Electricity, gas, water	34	36	37	41	45	45	45
Construction	263	292	309	383	435	480	545
Trade	496	520	572	663	745	785	815
Transport and communication	259	272	283	300	305	310	315
Other	958	1068	1146	1269	1400	1510	1635
Total	3788	3996	4144	4483	4800	5000	5250

III. DENSITY OF ENGINEERS

Table 2 and graph 1 (1) show the number of engineers per thousand of the total number of workers per branch of industry. For reasons of comparison **the future densities, finally adopted as showing the demand, are also presented/**

Table 2. NUMBER OF ENGINEERS AS o/oo OF EMPLOYMENT, PER BRANCH OF INDUSTRY

	1951	1955	1960	1965	1970	1975	1980
1. Agriculture	0.00	0.00	0.05	0.10	0.15	0.25	0,40
2. Mining, chemicals, petroleum	6.75	8.45	10.30	10.50	12,50	16,50	20,00
3. Food, tobacco, etc.	0.45	0.50	0.50	0.75	1.10	1.45	1,85
4. Textiles, footwear	0.45	0.60	0.75	0.85	1,20	1.55	1,90
5. Paper	1.40	1.50	2.05	1.90	2.95	3.55	4,35
6. Basic metals, machinery	2.20	2.40	2.40	2.45	2.50	2.55	2,60
7. Electrical machinery and apparatus	5.50	7.15	7.80	8.45	11,00	13.00	16,00
8. Transport equipment	1.40	2.05	2.25	2.35	2,80	3.15	3,65
9. Miscellaneous industries	0.35	0.45	0.50	0.55	0.65	0.70	0.75
10. Electricity, gas, water	7.00	7.95	8.15	8.05	10,10	12.20	12,45
11. Construction	0.85	1.00	1.25	1,25	1.75	2.10	2,40
12. Trade	0.40	0.45	0.50	0.45	0.60	0.65	0.75
13. Transport and communication	1.35	1.35	1.35	1.30	1.35	1.35	1.35
14. Government services	-	-	-	-	-	-	-
15. University education a)	35.00	50.00	65.00	70.00	85,00	95.00	110.00
16. General and vocational education b)	4.50	.	3.00	3.00	5.00	5.00	5.00
17. Advisory bodies	-	-	-	-	-	-	-
18. Other	-	-	-	-	-	-	-
19. Total	1.50	1.85	2.20	2.50	3.35	4.00	5.00

a) Engineers as o/oo of students in technology.
b) Engineers as o/oo of pupils in grammar school education.

---

(1) In the graph the branches of industry have been given the same number as in Table 2.

There are considerable differences between the various branches of industry in the density of engineers (1). The graph shows that the densities have increased considerably over the period 1951-1965.

Interpretation of past development in these densities is not easy and extrapolation of the tendencies of the past in the future as a means of assessing future demand of engineers should be made carefully. This also holds for the relations shown in following sections. One should always keep in mind that the stock of engineers in the period considered is up to a very large extent determined by supply factors. Of importance is the stock and its age distribution at the beginning of the period and the flow of graduates in the period 1951-1965. The flow of graduates in the first half of this period is determined by the number of students enrolled in 1951 (the average length of study is 7 years) at the Delft university of technology.

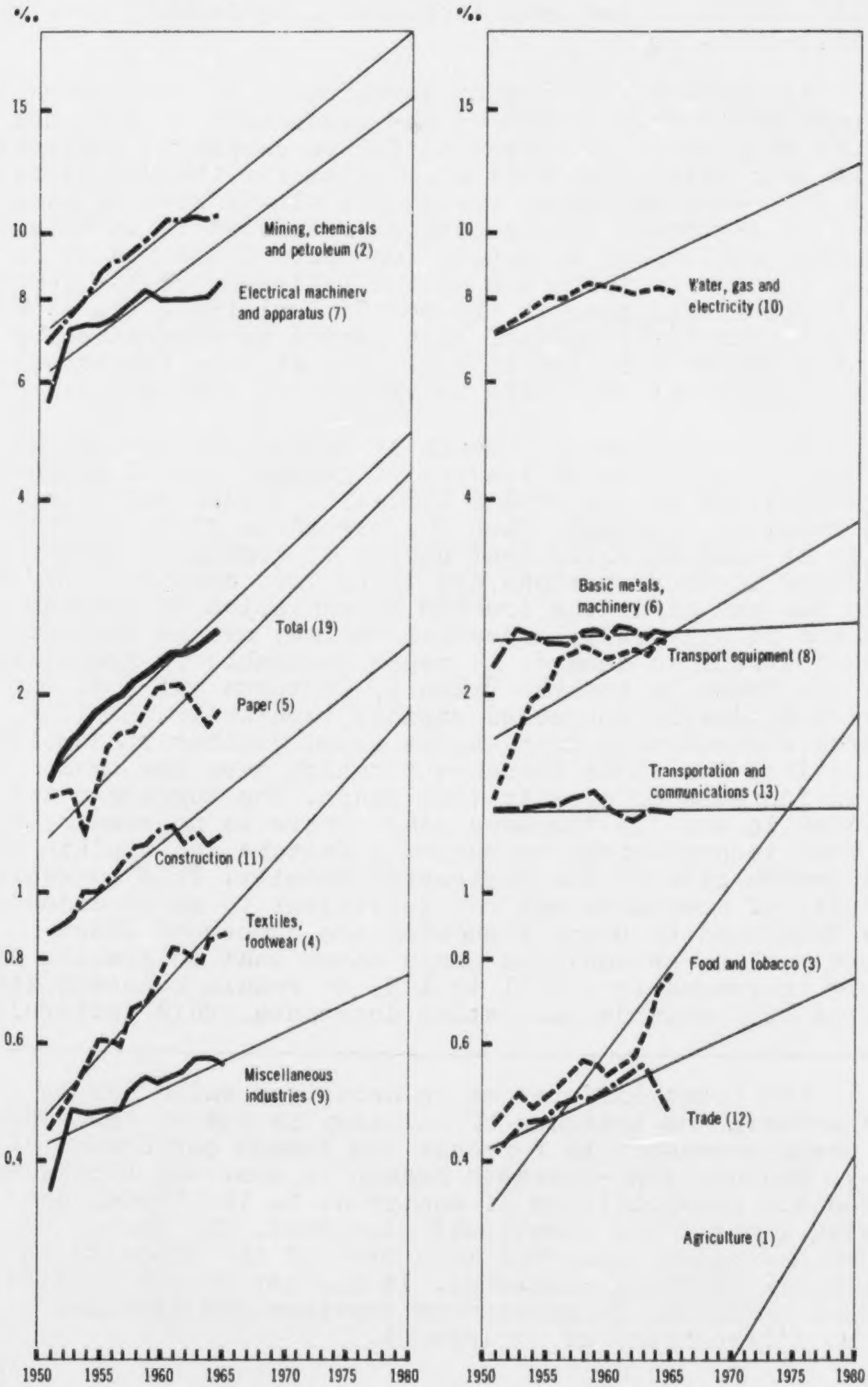
In the following 7 years it is largely determined by the number of certificated leavers of grammar school education (science section) in the period 1951-1958 during which the numbers remained constant. When due regard is given to this mechanism it will be clear that supply of graduates seldom will match demand if short periods are taken into account. Only in the long run and given the freedom of admission to grammar schools and to university education one may assume that supply will adapt itself to demand. It seems desirable to keep this in mind if one tries to analyse Graph 1. It turns out that the density of engineers increased rapidly towards around 1958, afterwards a slackening down can be seen. Similar tendencies can be noticed for those branches in which over the whole period an increase in density took place. The turning point is not located in exactly the same year. There is no reason to assume that technological or economic factors can explain the reduced growth rate in the engineers' density. This suggests that supply of graduates was not sufficient to match demand. This is confirmed by Graph 2 showing the number of Dutch engineers working abroad. The graph shows that emigration of engineers increased from 1951 to 1955 to remain constant till 1957; from 1958 onwards emigration decreases. This pattern of

---

(1) The great differences in densities which can be noticed between the branches of industry is one of the reasons why it seems necessary to forecast the demand per branch of industry. Another down-to-earth reason is that any breakdown increases the possibilities of analysis. In the "branches" university, general and vocational education, the number of engineers have been expressed as a o/oo of the students in the types of education concerned. It was not deemed realistic to express engineers in government services and advisory bodies as a percentage of employment.

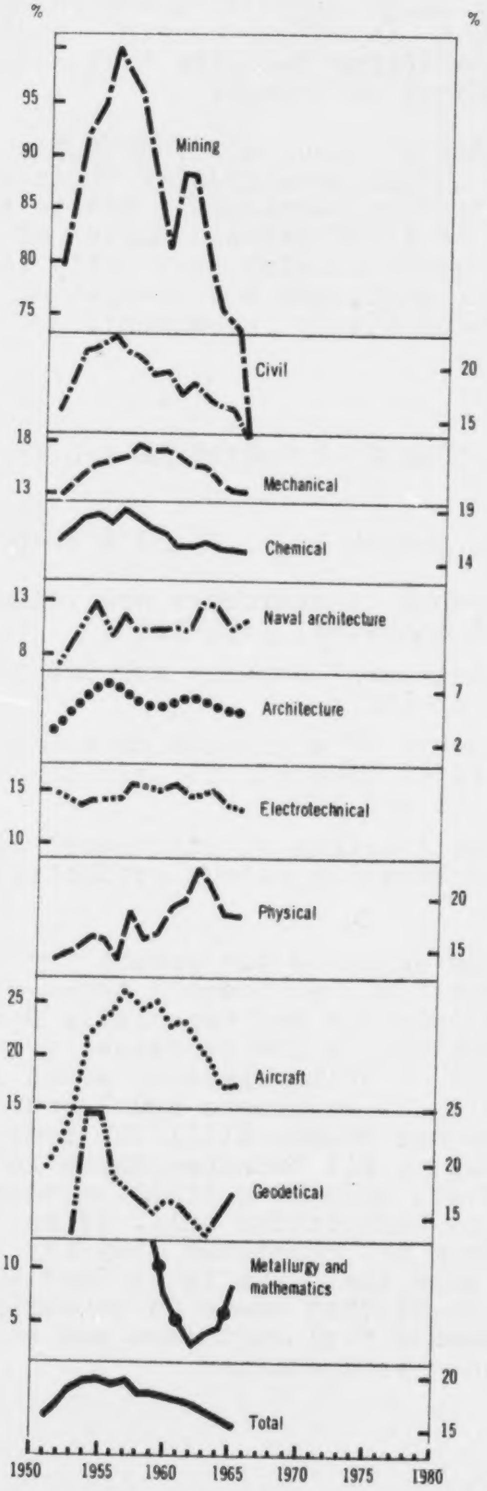
Graph 1

NUMBER OF ENGINEERS AS ‰ OF EMPLOYMENT, PER BRANCH OF INDUSTRY



Graph 2

NUMBER OF ENGINEERS ABROAD AS % OF ENGINEERS IN THE NETHERLANDS, TO FIELD OF STUDY



development can be noticed for the various fields of study, with some shifts in the date of the turning points. The development in emigration (a rather sensible indicator of surpluses and shortages - confirms the idea that after 1958 supply of graduates fell short of demand.

In order to check more carefully if the changes in the development in the densities of engineers could be explained by changes in economic development and to see whether good relations could be found between number of engineers and economic development we have tried especially to find correlations between number of engineers and production (value added, labour productivity) respectively investment.

IV. NUMBER OF ENGINEERS AND PRODUCTION

In the Graphs 3, 4, 5 and 6 respectively are shown:

a) number of engineers and value added per branch of industry, 1951-1965;

b) engineers' density and labour productivity, 1951-1965;

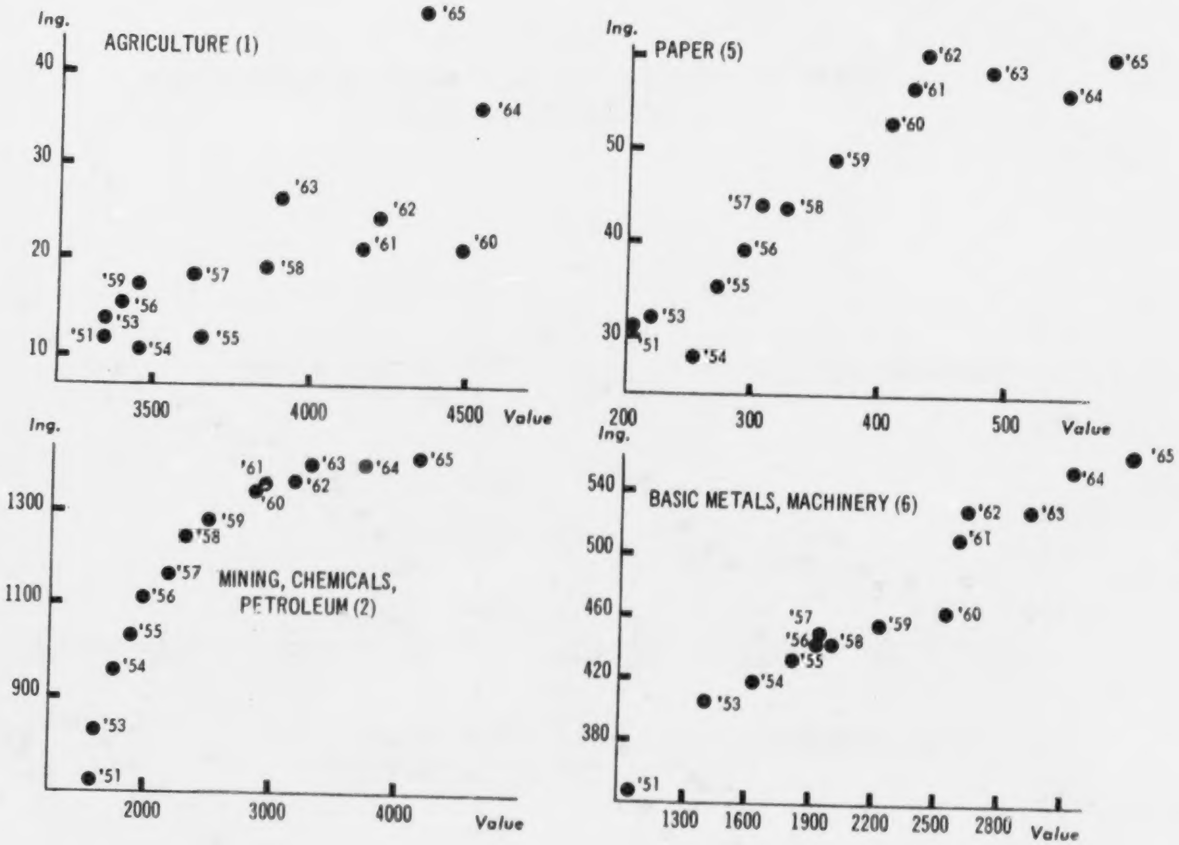
c) number of engineers as a o/oo of employment and labour productivity per branch of industry, in 1951 and 1965;

d) the increase in engineers' density and the increase in labour productivity between 1951 and 1965.

In this sequence the graphs try to test relations of increasing sophistication. Graph 3 shows for some branches of industry a good relation and especially for the total of branches of industry. If the increase in scale (i.e. employment) is taken away out of this relation, which is done in Graph 4 (by taking density of engineers and labour productivity) then the relation becomes worse. Still for some branches of industry and for the total of all branches there is still a good relation. These are, however, relations found in time and it may be that they show a trend correlation only. It may be that if time is also excluded from the relations they may even become worse. Graphs 5 and 6 show that this is in fact the case. And the conclusion has to be that there is no definite relation between number of (or demand for) engineers and economic growth as measured by labour productivity.

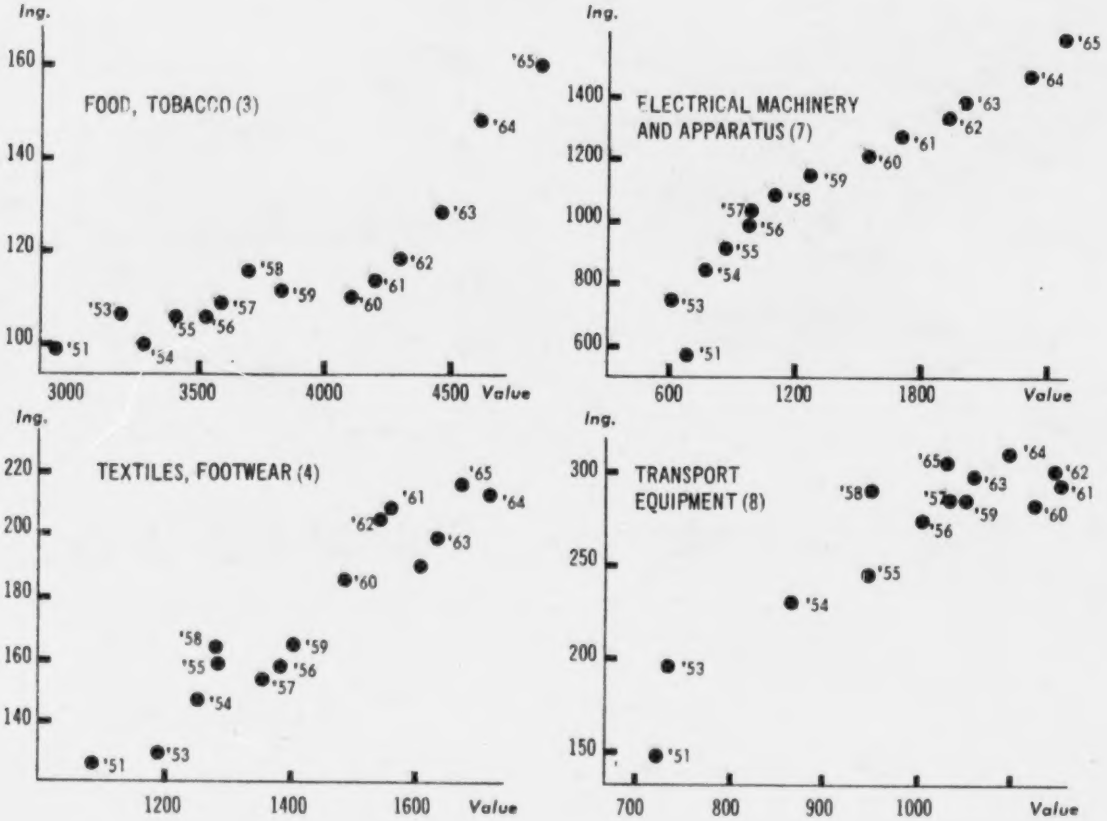
Graph 3

NUMBER OF ENGINEERS AND VALUE ADDED (in mln gld of 1964) PER BRANCH OF INDUSTRY



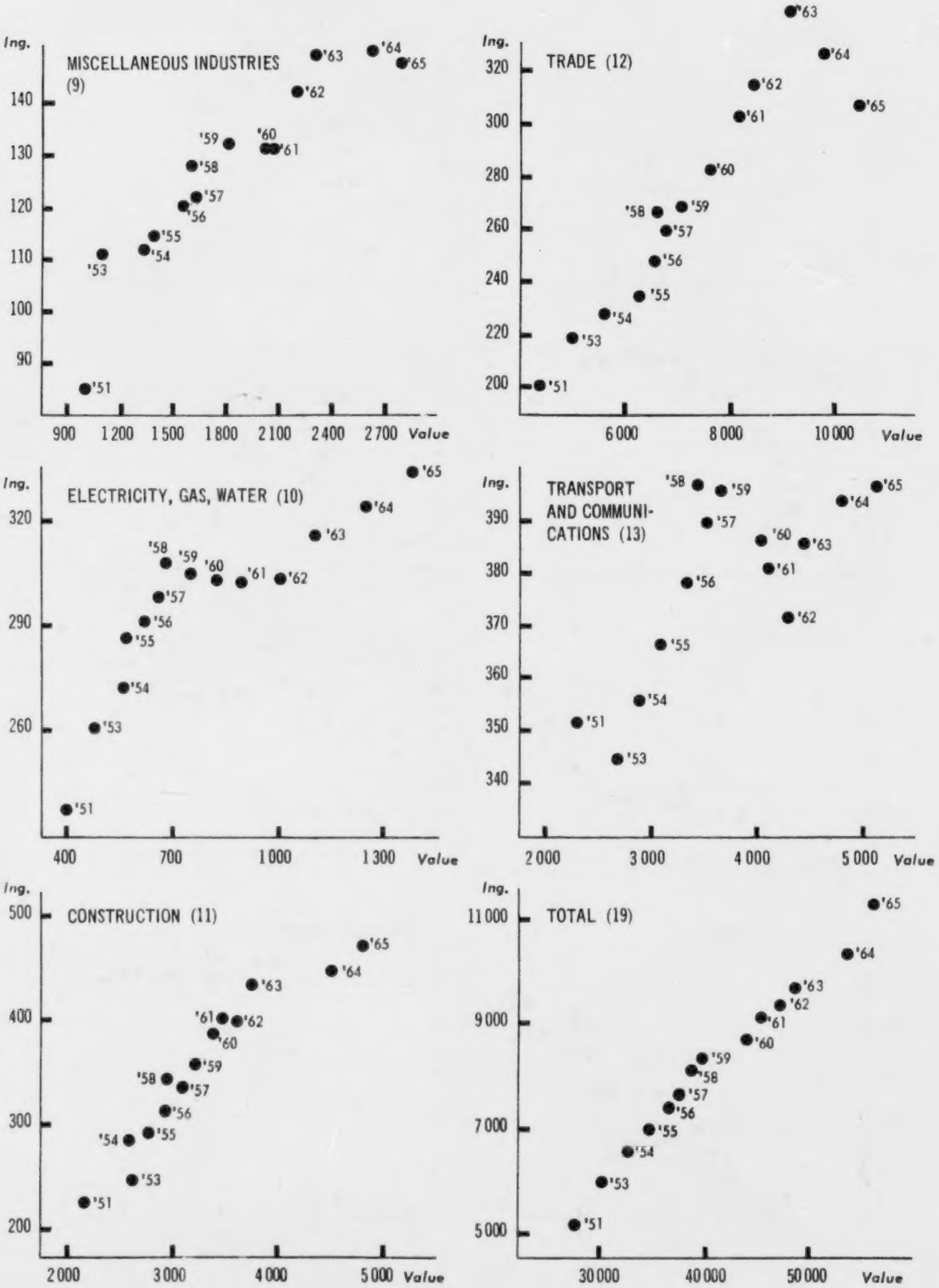
Graph 3 *(Cont'd)*

NUMBER OF ENGINEERS AND VALUE ADDED (in mln gld of 1964)
PER BRANCH OF INDUSTRY



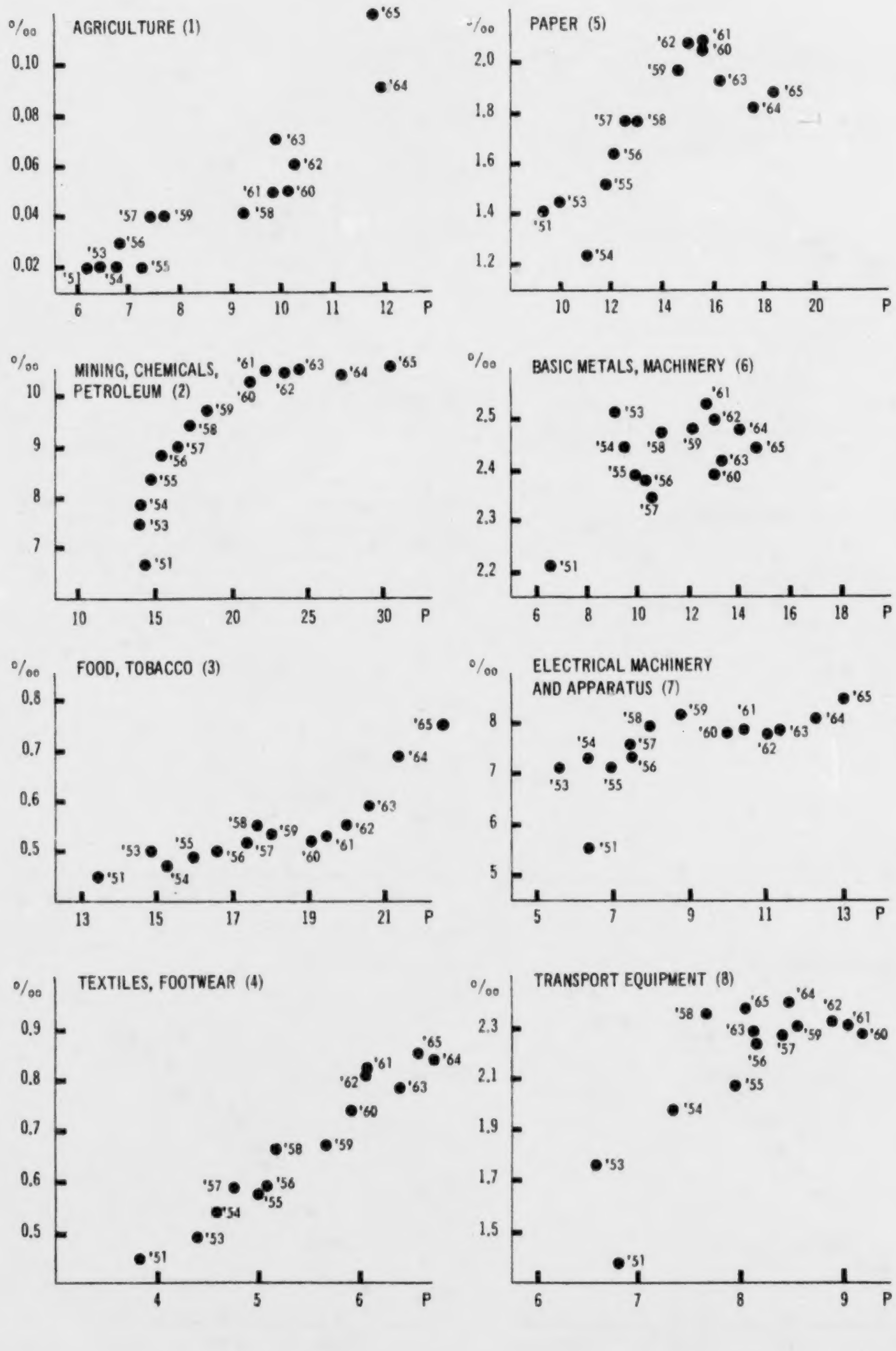
Graph 3 *(cont'd)*

NUMBER OF ENGINEERS AND VALUE ADDED (in mln gld of 1964)
PER BRANCH OF INDUSTRY



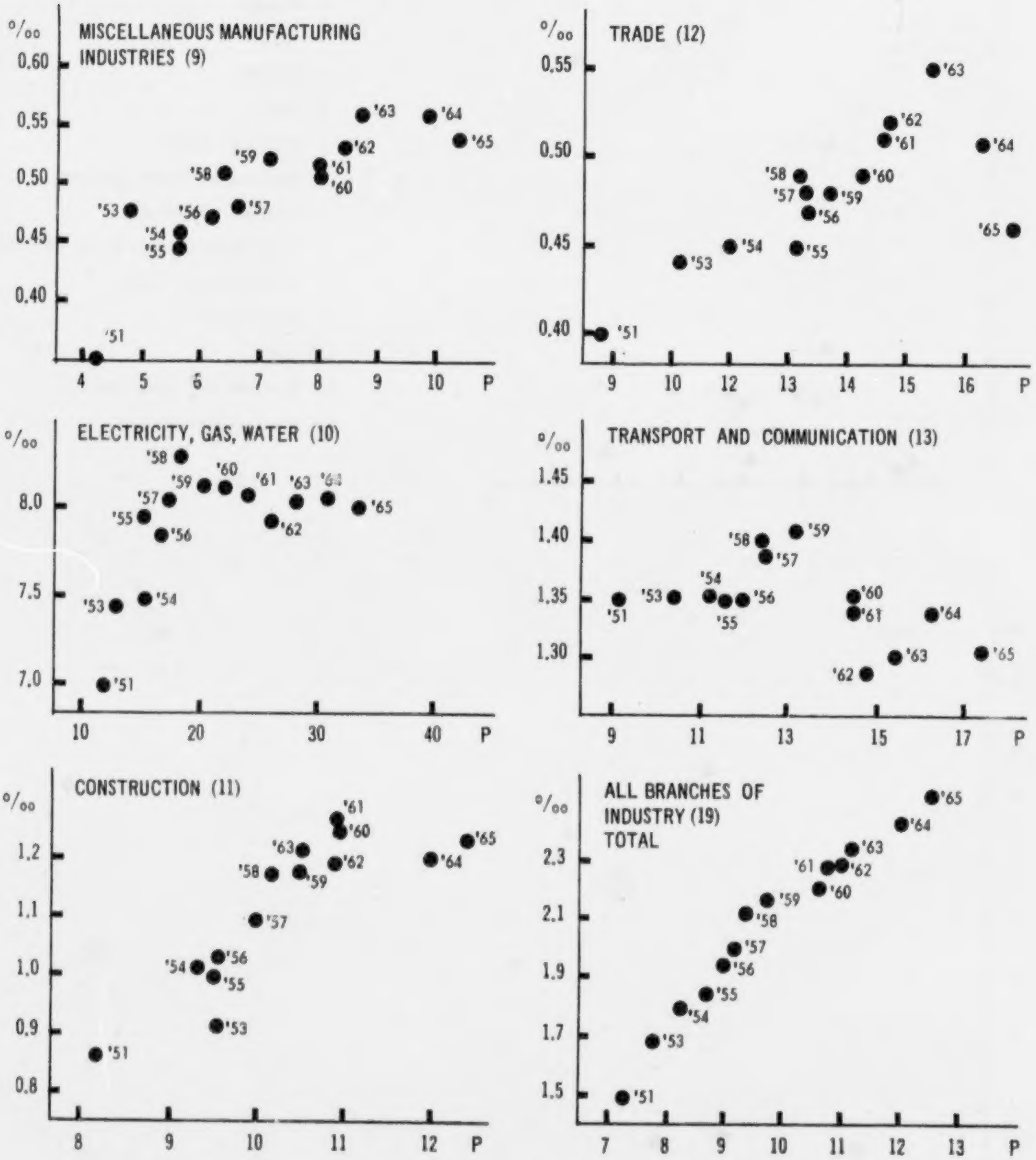
Graph 4

NUMBER OF ENGINEERS AS °/₀₀ OF EMPLOYMENT AND LABOUR PRODUCTIVITY (in 1 000 guilders of 1964), PER BRANCH OF INDUSTRY 1951 - 1965



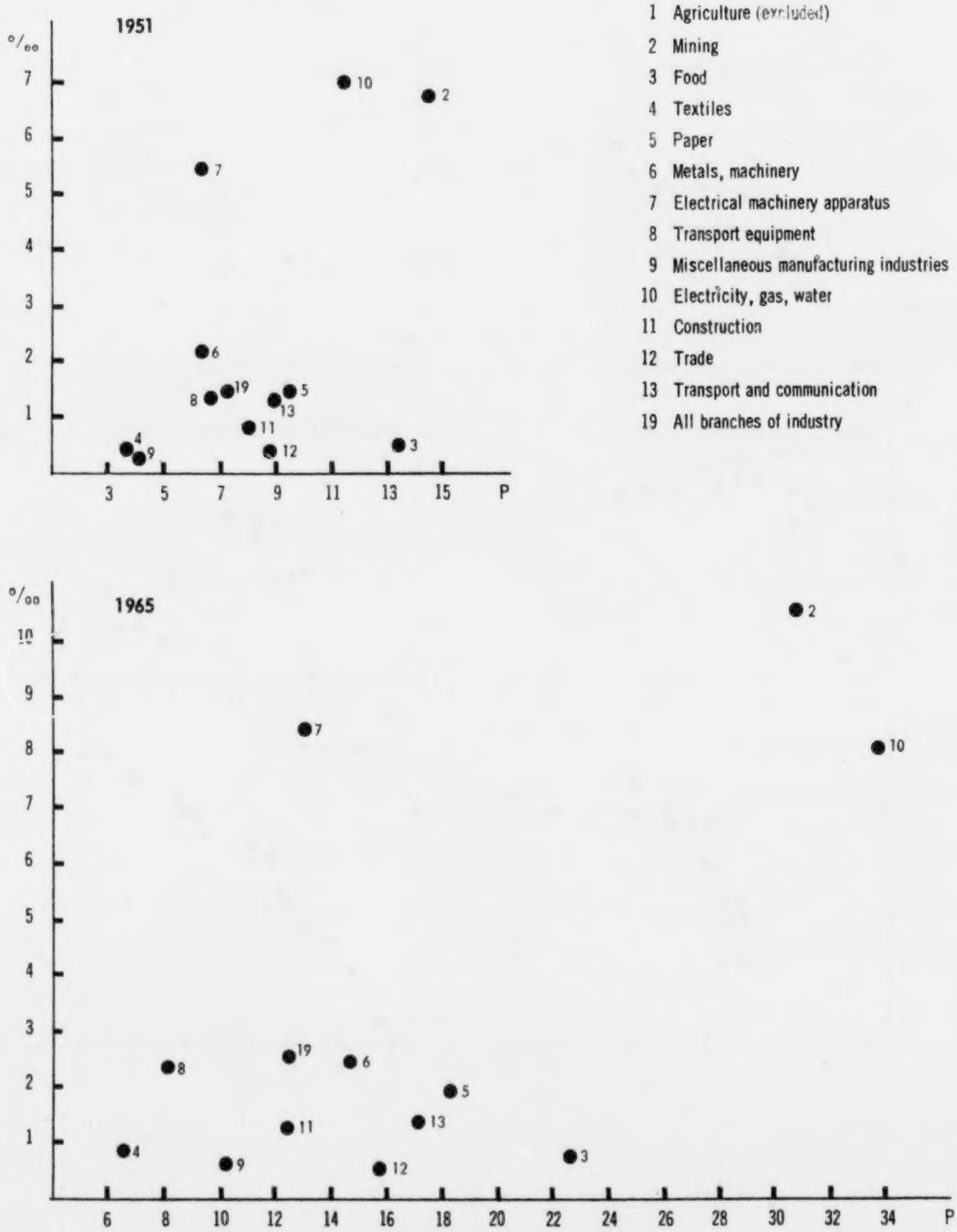
Graph 4 *(cont'd)*

NUMBER OF ENGINEERS AS °/oo OF EMPLOYMENT AND LABOUR PRODUCTIVITY (in 1 000 guilders of 1964), PER BRANCH OF INDUSTRY 1951 - 1965



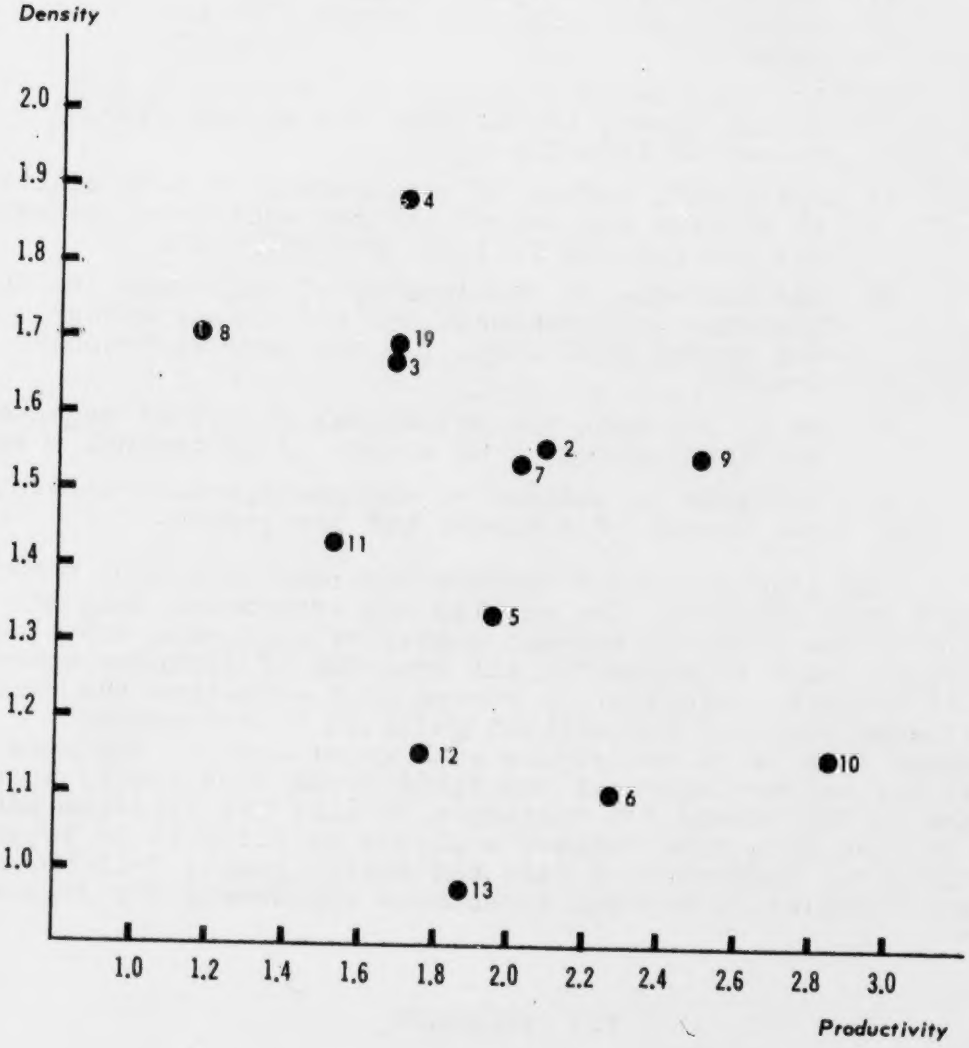
Graph 5

NUMBER OF ENGINEERS AS °/₀₀ OF EMPLOYMENT AND LABOUR PRODUCTIVITY (in 1000 guilders of 1964) PER BRANCH OF INDUSTRY, 1951 AND 1965



Graph 6

$\frac{\text{DENSITY OF ENGINEERS}}{\text{DENSITY OF ENGINEERS}}$ AND $\frac{\text{LABOUR PRODUCTIVITY (1965)}}{\text{LABOUR PRODUCTIVITY (1951)}}$



V. NUMBER OF ENGINEERS AND INVESTMENT

Graphs 7 to 12 show respectively.

a) the density of engineers and investment per worker around 1952 and around 1964 per branch of industry;

b) the density of engineers and investment per additional worker around 1952 and around 1964, per branch of industry ;

c) additional number of engineers as a o/oo additional workers and investment per additional worker for the periods 1951-54 and 1962-65 ;

d) the increase in the density of engineers and the increase in investment per additional worker over the period 1952-1964, for the various branches of industry;

e) as d) but here the additional number of engineers has been expressed as a o/oo of additional workers;

f) increase in numbers of engineers and investment per branch of industry and per period.

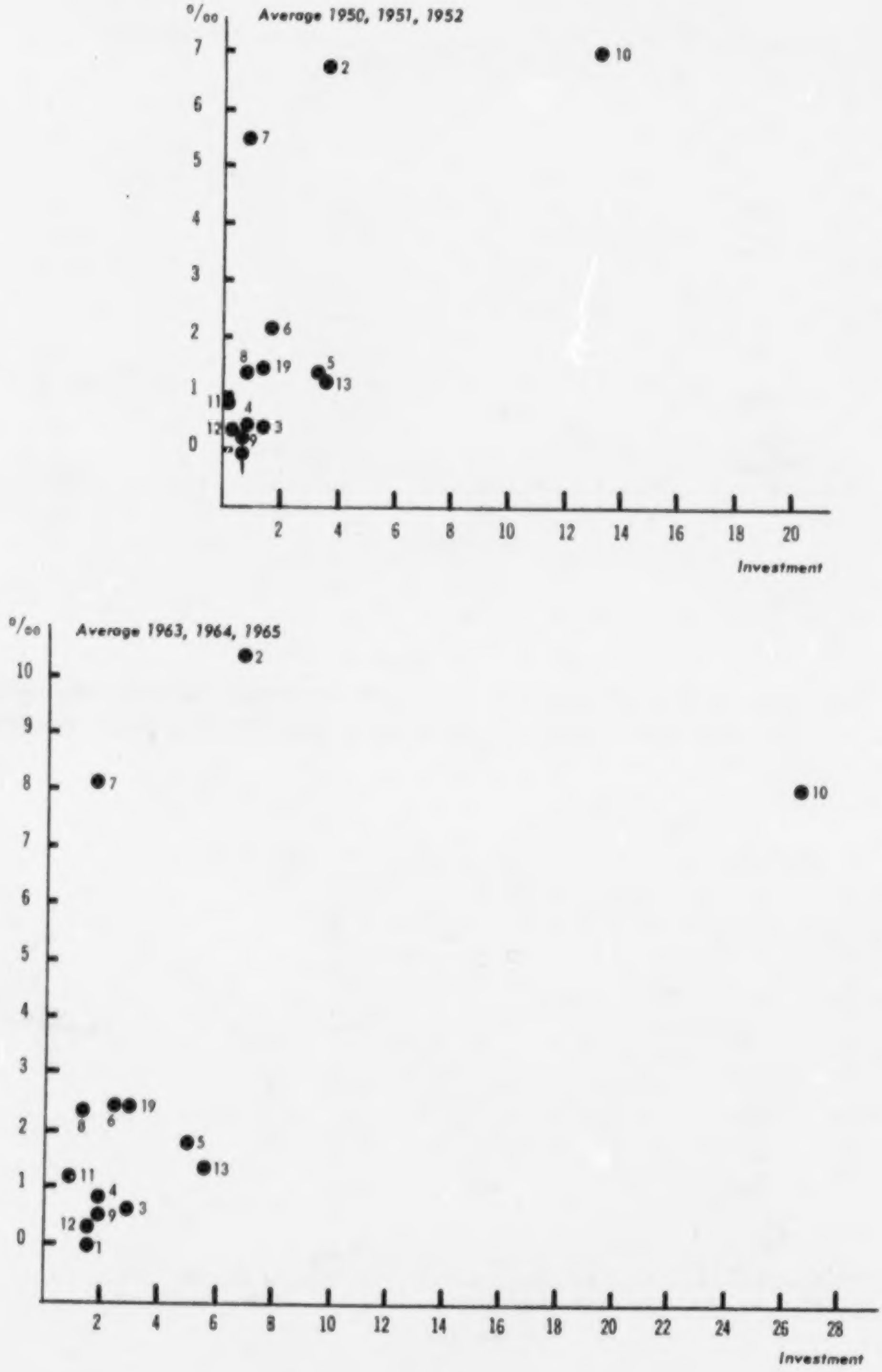
The graphs reflect various theories, but none proves to give a good relation. The results are even worse than the analysis of the relation between number of engineers and production. Graph 12 shows for all branches of industry something of a stable relation. It proves that with time the number of engineers required per million guilders of investment decreases. This is in accordance with experience of business people, but extrapolation of the trend would soon result in no increase in the demand for engineers at all. The relation has to be doubted as a more refined analysis in which it is tried to exclude the influence of time and scale (graphs 7-11) does not show any correlation between investment and demand for engineers.

VI. FORECAST

Given the fact that no good relations were found between number of engineers and economic growth (i.e. labour productivity, investment) it has been preferred to use a simple method of forecasting i.e. extrapolation of densities per branch of industry. As Graphs 1 and 2 (and also 3) suggest that supply of engineers fell short of demand, the extrapolation of densities has been based on especially the tendencies which can be noticed before 1958. No doubt this "extrapolation with phantasy" introduces an arbitrary element in the forecasts.

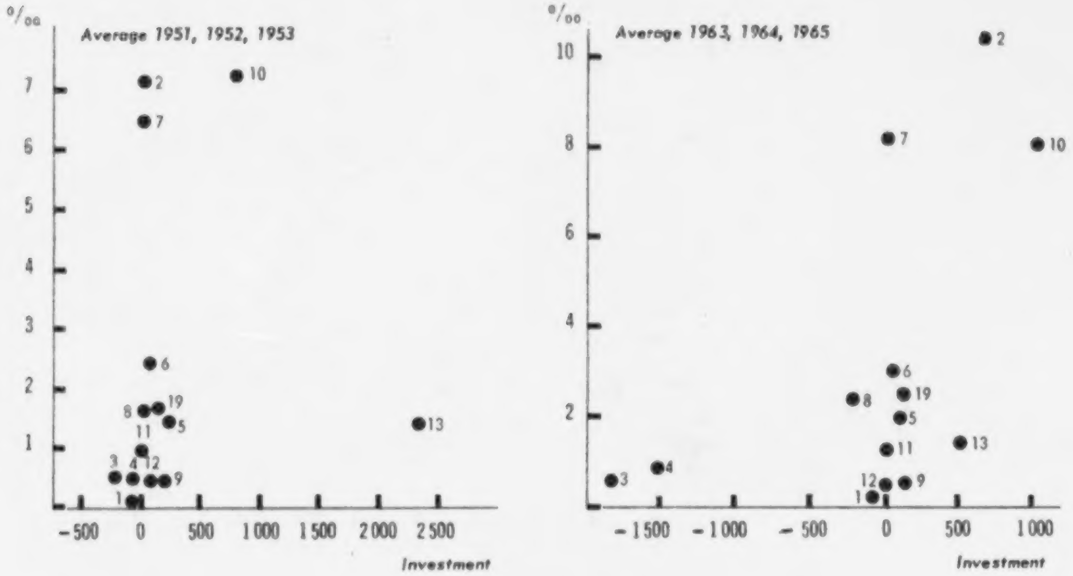
Graph 7

NUMBER OF ENGINEERS AS °/₀₀ OF EMPLOYMENT AND INVESTMENT PER WORKER (in 1 000 guilders of 1964), PER BRANCH OF INDUSTRY



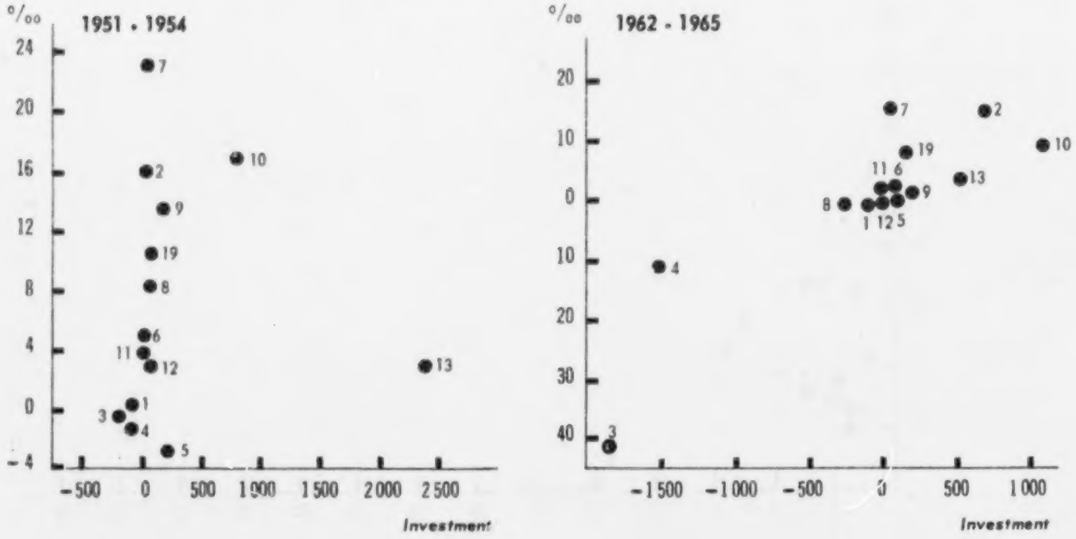
Graph 8

NUMBER OF ENGINEERS AS °/₀₀ OF EMPLOYMENT AND INVESTMENT PER ADDITIONAL WORKER (in 1 000 guilders of 1964), PER BRANCH OF INDUSTRY



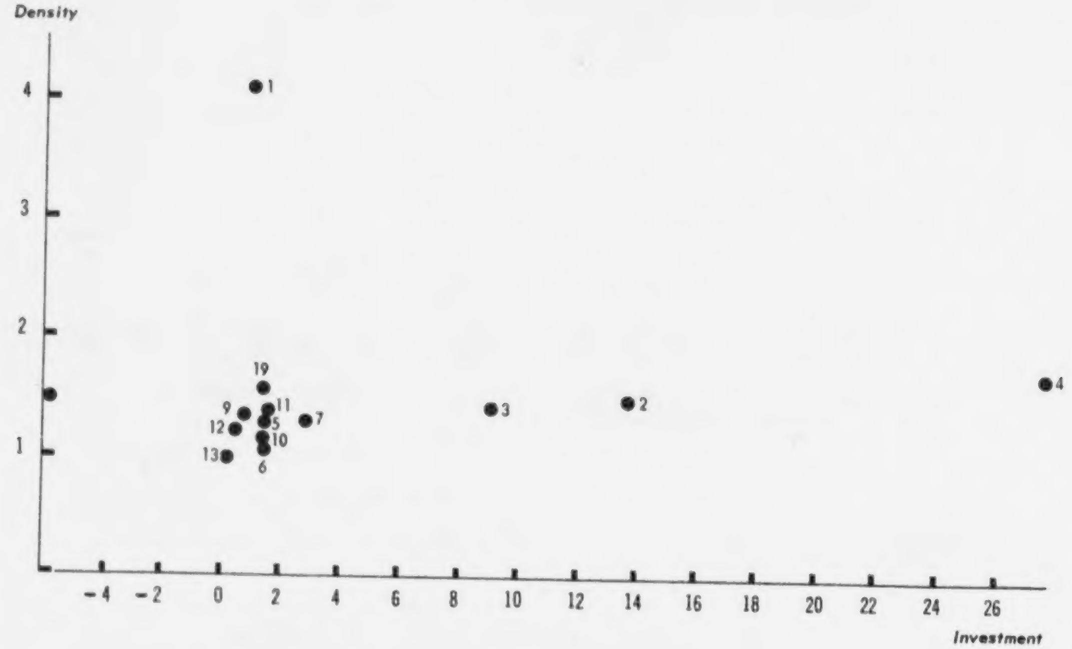
Graph 9

ADDITIONAL NUMBER OF ENGINEERS AS °/₀₀ OF ADDITIONAL WORKERS AND INVESTMENT PER ADDITIONAL WORKER (in 1 000 guilders of 1964), PER BRANCH OF INDUSTRY



Graph 10

DENSITY OF ENGINEERS / DENSITY OF ENGINEERS AND INVESTMENT PER ADDITIONAL WORKER (1964) / INVESTMENT PER ADDITIONAL WORKER (1952)

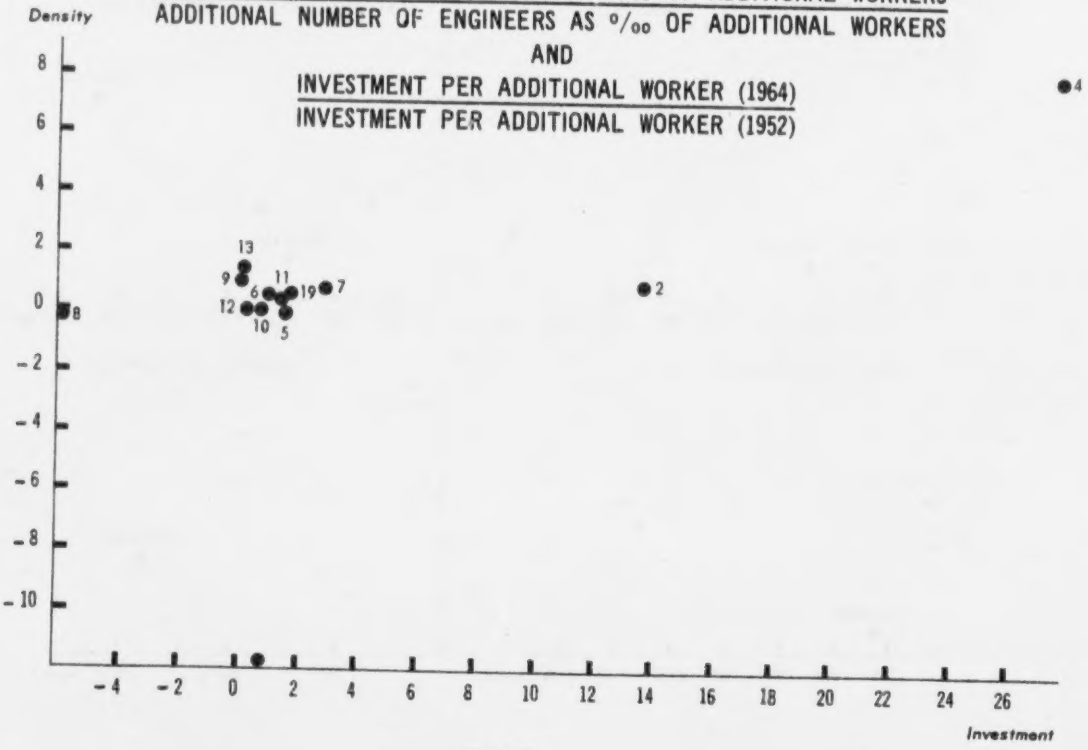


Graph 11

ADDITIONAL NUMBER OF ENGINEERS AS ‰ OF ADDITIONAL WORKERS / ADDITIONAL NUMBER OF ENGINEERS AS ‰ OF ADDITIONAL WORKERS

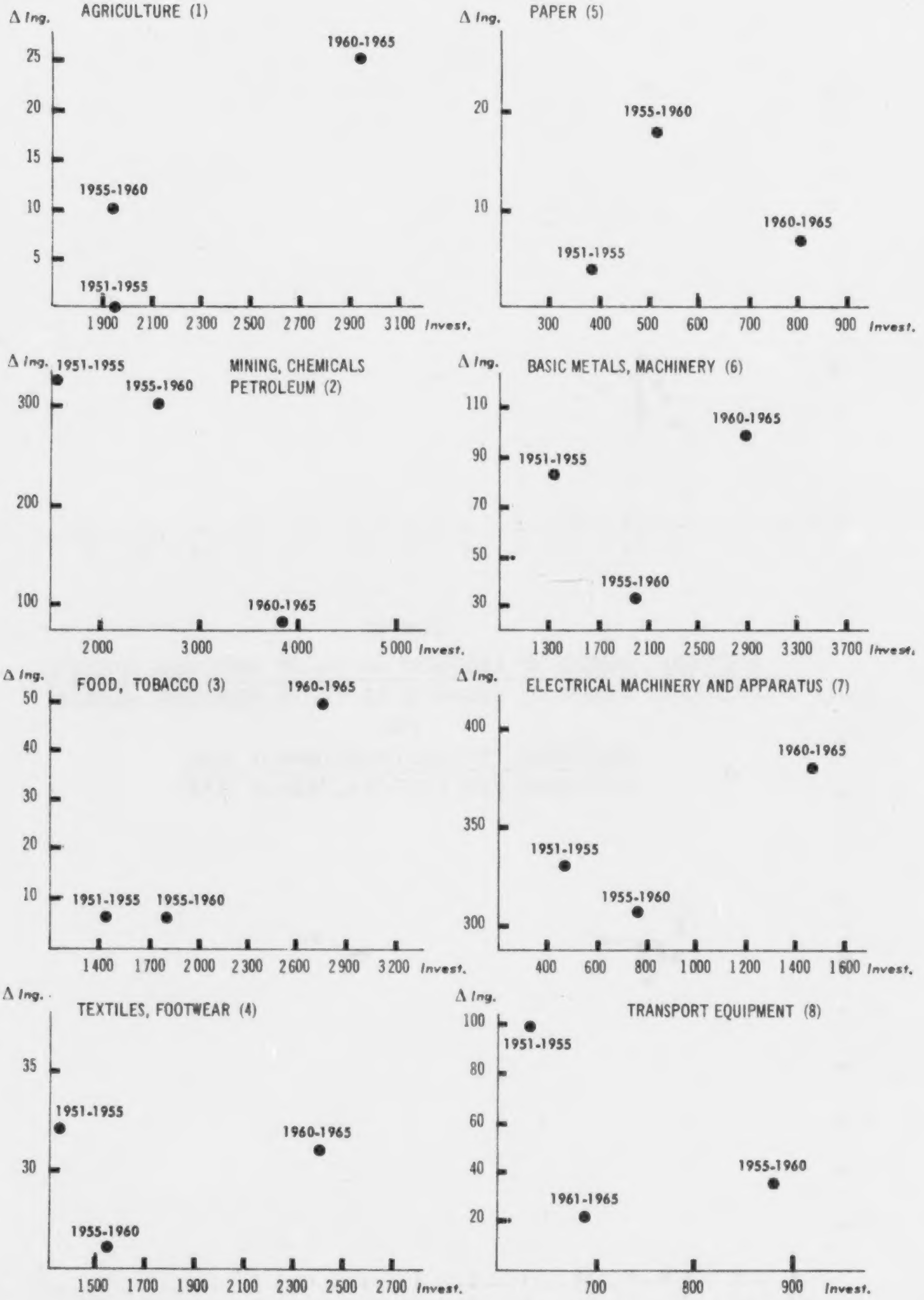
AND

INVESTMENT PER ADDITIONAL WORKER (1964) / INVESTMENT PER ADDITIONAL WORKER (1952)



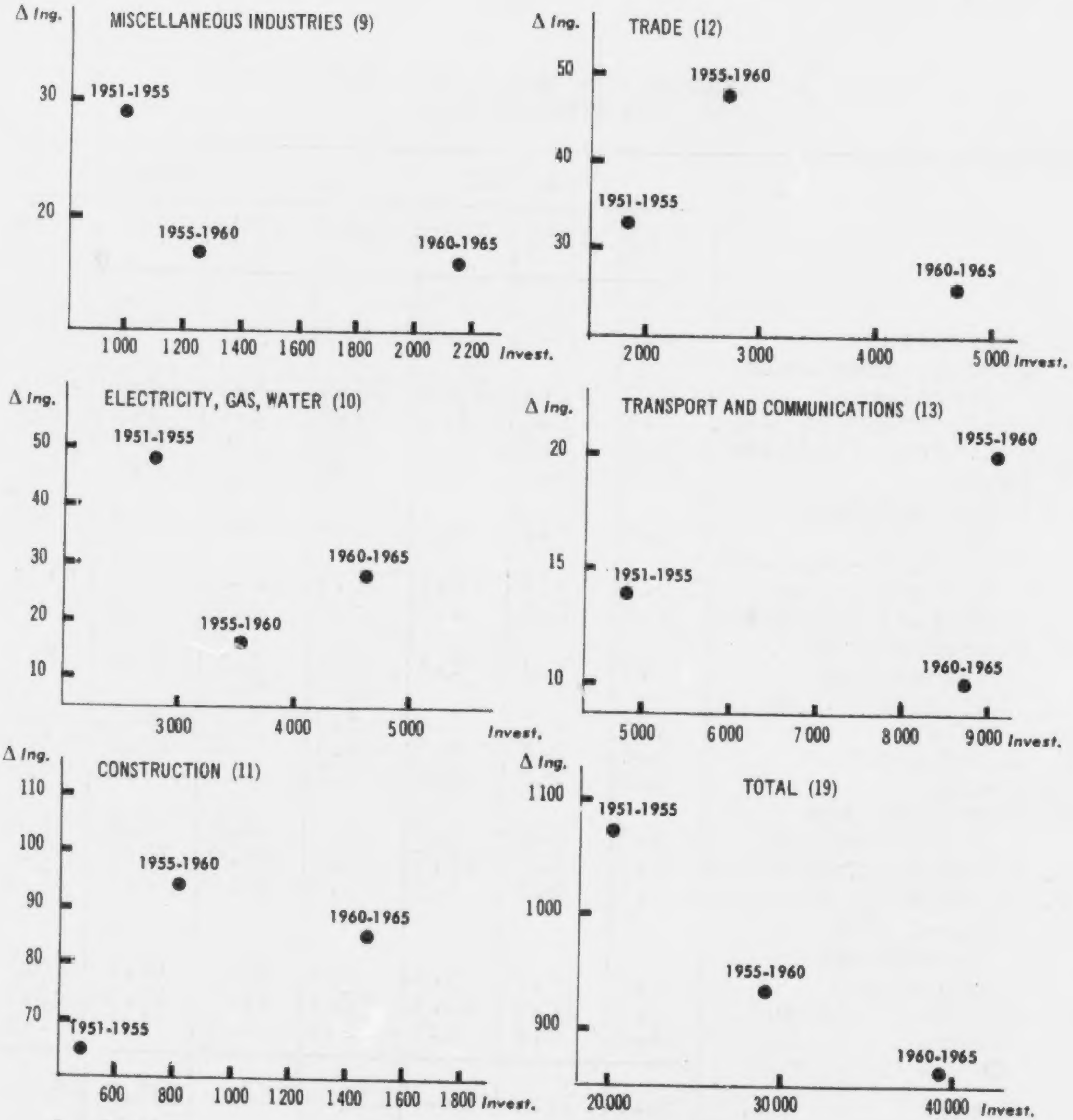
Graph 12

INCREASE IN NUMBER OF ENGINEERS AND INVESTMENT (in mln gld of 1964) PER BRANCH OF INDUSTRY AND PERIOD



Graph 12 *(cont'd)*

INCREASE IN NUMBER OF ENGINEERS AND INVESTMENT (in mln gld of 1964) PER BRANCH OF INDUSTRY AND PERIOD



1 = Agriculture
2 = Mining, chemicals
3 = Food
4 = Textiles
5 = Paper
6 = Basic metals, etc.
7 = Electrical machinery

8 = Transport equipment
9 = Miscellaneous industries
10 = Electricity, gas, water
11 = Construction
12 = Trade
13 = Transport and communication
19 = All branch of industry

Multiplication of the densities (Table 2 and Graph 1) by total employment in the various branches of industry gives the numbers of engineers required. These are shown in Graph 13 and Table 3.

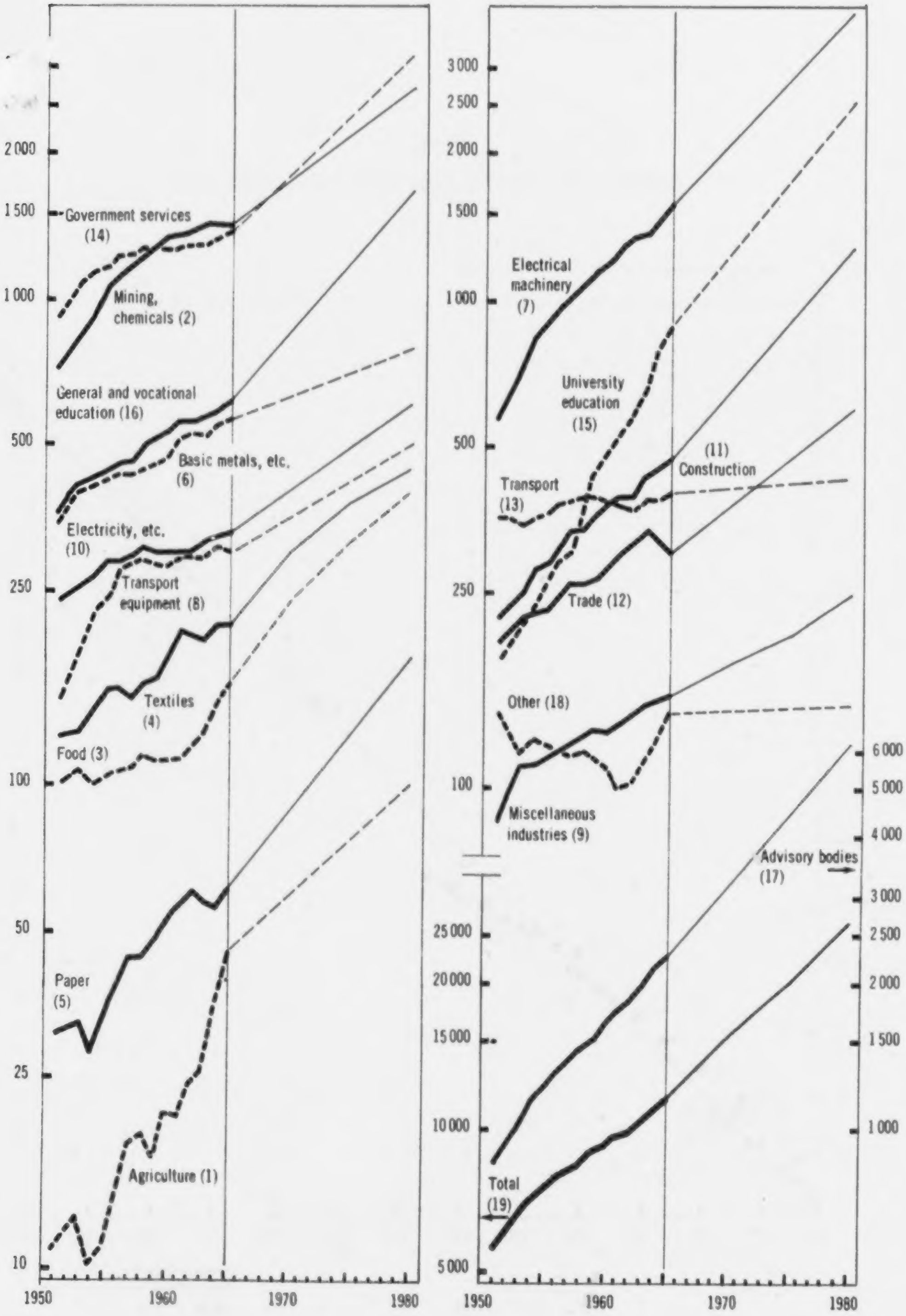
Table 3. DEMAND FOR ENGINEERS, PER BRANCH OF INDUSTRY (x 100)

	Actual					Demand	
	1951	1955	1960	1965	1970	1975	1980
1. Agriculture	0.1	0.1	0.2	0.5	0.6	0.8	1.0
2. Mining, chemicals, petroleum	7.2	10.5	13.5	14.3	16.5	22.0	27.0
3. Food, tobacco, etc.	1.0	1.0	1.1	1.6	2.4	3.2	4.1
4. Textiles, footwear	1.3	1.6	1.9	2.2	3.0	3.8	4.5
5. Paper	0.3	0.4	0.5	0.6	1.0	1.4	1.8
6. Basic metals, machinery	3.5	4.3	4.6	5.6	6.3	7,0	7.8
7. Electrical machinery and apparatus	5.7	9.0	12.1	15.9	23.5	30.0	41.0
8. Transport equipment	1.5	2.5	2.8	3.0	3.8	4.3	5.0
9. Miscellaneous industries	0.9	1.1	1.3	1.5	1.8	2.1	2.5
10. Electricity, gas, water	2.4	2.9	3.0	3.3	4.5	5.5	6.0
11. Construction	2.3	2.9	3.9	4.7	7.6	10.1	13.1
12. Trade	2.0	2.3	2.8	3.1	4.5	5.3	6.0
13. Transport and communication	3.5	3.7	3.9	4.0	4.1	4.2	4.3
14. Government services	9.4	11.8	12.7	13.8	20.0	25.0	32.0
15. University education	1.9	2.6	4.9	9.0	14.5	18.5	25.0
16. General and vocational education	3.6	4.3	5.4	6.2	12.0	14.0	16.5
17. Advisory bodies	8.6	12.0	16.1	22.4	31.5	45.0	63.0
18. Other	1.4	1.2	1.1	1.6	1.5	1.5	1.5
19. Total	56.0	74.0	92.0	113.0	160.0	200.0	260.0

The graph and the table show the remarkable fast growth of engineers in university education and advisory bodies. Of the total increase in number of engineers (2,000) between 1960 and 1965 some 400 or 20% were employed by university education and 600 or 30% by "advisory bodies".

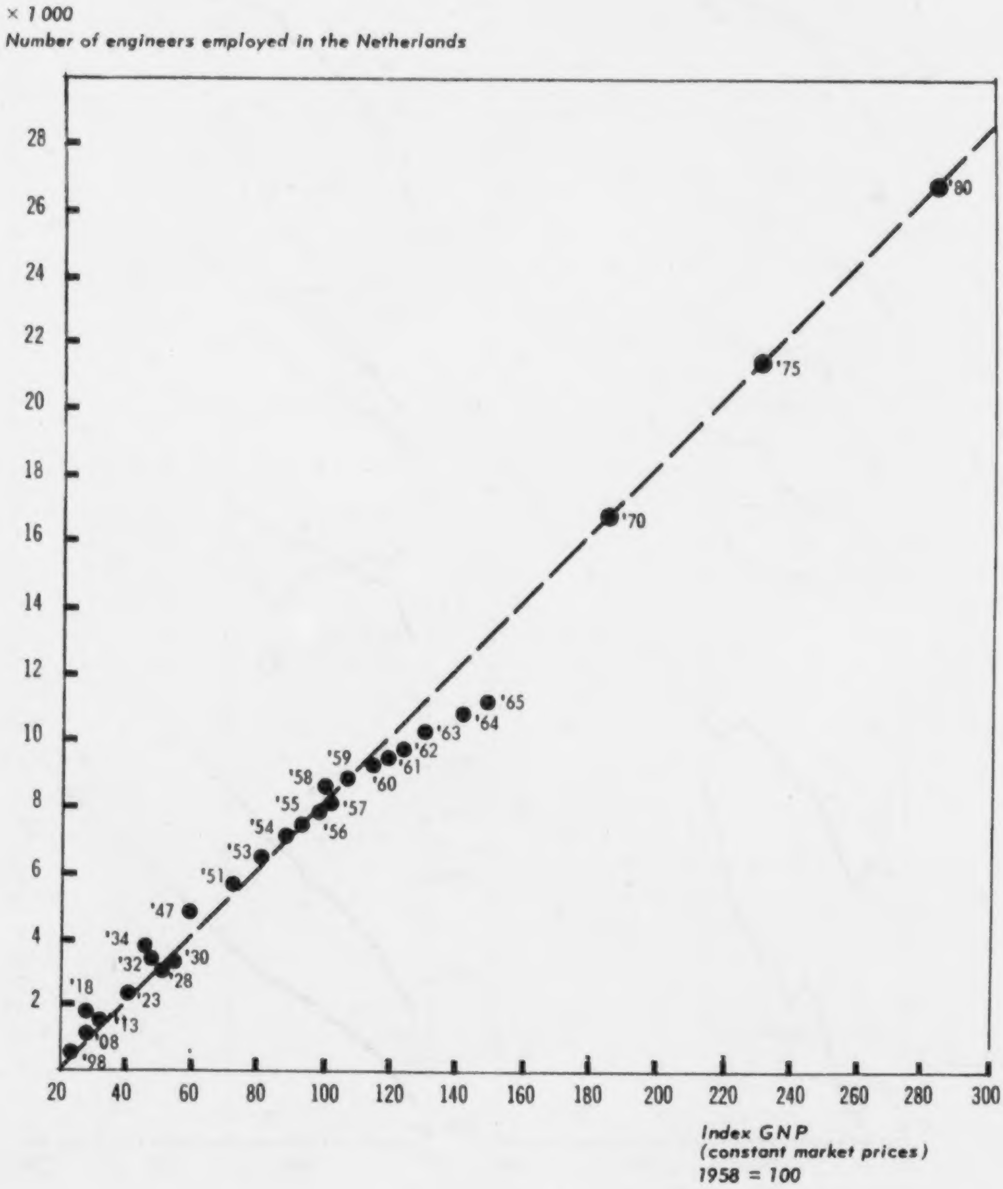
Graph 13

NUMBER OF ENGINEERS, PER BRANCH OF INDUSTRY



Graph 14

NUMBER OF ENGINEERS AND GNP, 1898 - 1980



The outcomes of this forecast based on extrapolation of the densities per branch of industry has been checked by using the global relation between number of engineers and GNP which can be noticed over a long period (Graph 14). This graph also shows that the relation which holds up till 1958 is changed afterwards. If the relation for 1898-1958 is used and extrapolated the same demand for engineers is found for 1980 as was found by using the more refined approach.

The forecast of the demand for engineers has been broken down to field of study by extrapolating the tendencies in the distribution over the fields of study per branch of industry.

VII. CONFRONTATION OF DEMAND AND SUPPLY

In Table 4 future demand and supply (1) are compared.

Table 4. DEMAND FOR AND SUPPLY OF ENGINEERS (x 1000)

	1970	1975	1980
Demand	16,0	20,0	26,0
Supply	13.6	18.0	23.4

This table suggests that up till 1980 the shortage of engineers (about 10% to 15%) might continue.

Interpretation of this outcome should be made carefully. Given the errors of assessment one can argue that a difference of 10-15% is in between the margins so that one cannot label the difference as a shortage. The difference is furthermore not bigger than it has been since 1958. One should furthermore also take into account the development in the number of college engineers and that of the graduates in mathematics and sciences.

---

(1) The supply forecast is of the normal type. What will remain of the 1965 stock has been calculated by taking into account death, retirement and pensioning. The addition to this stock (the flow of graduates) has been assessed by giving due regard to the numbers in the age group 12-13 years, participation in grammar school education, passing ratios in this type of education, transfer to the universities of technology, passing ratios in this field of education, emigration etc.

VIII. COLLEGE ENGINEERS

Table 5 shows the ratios of the numbers of college engineers to university engineers (stock figures) per field of study.

Table 5. NUMBER OF COLLEGE ENGINEERS PER UNIVERSITY ENGINEER, TO FIELD OF STUDY

	1920	1930	1935	1950	1960	1965	1970	1975	1980
Civil	0.2	0.4	0.9	2.4	2.8	3.0	3.1	2.8	2.5
Architecture	1.3	5.1	7.9	12.9	11.2	10.4	9.8	7.1	5.3
Mechanical	0.6	1.6	2.5	4.8	5.9	5.9	6.0	5.4	4.8
Electrotechnical	0.5	1.3	2.0	3.7	3.8	3.8	4.1	3.8	3.5
Chemical	-	0.1	0.3	0.9	1.1	1.2	1.3	1.2	1.1
Physical	-	-	-	0.5	0.4	0.4	0.4	0.4	0.4
Naval architecture	0.3	0.6	1.1	3.2	3.3	3.9	4.1	3.9	3.2
Aircraft	-	-	-	-	2.7	2.1	2.0	1.9	1.5
Mining	3.5	5.1	5.4	6.4	6.9	6.5	5.6	5.0	4.4
Other	-	-	-	-	17.7	12.0	11.7	11.2	9.9
Total	0.5	1.3	2.1	3.9	4.1	4.1	4.2	3.7	3.2
Total number of college engineers a) (x 1000)	1.1	4.5	7.8	21.2	37.7	46.5	56.9	66.5	75.4
Total number of university engineers a) (x 1000)	2.0	3.4	3.7	5.4	9.2	11.3	13.6	18.0	23.4

a) After 1965 the figures were calculated on the basis of supply of graduates.

In time and between the various fields of study big differences in the ratios can be seen. These variations have not been accompanied by systematic complaints of either industrialists or engineers or college engineers. This suggests that a great deal of flexibility is possible in the technical cadre pyramid. Clear indications to alter the forecast of the demand for engineers can not be found if the ratio of college engineers to university engineers is taken into account.

Table 6. STOCK OF GRADUATES OF THE FACULTY OF MATHEMATICS AND SCIENCES AND STOCK OF ENGINEERS TO ECONOMIC SECTORS, 1930, 1947, AND 1960

	Scientists			Engineers			Scientists			Engineers		
	1930	1947	1960	1930	1947	1960	1930	1947	1960	1930	1947	1960
		Number			Number			%			%	
Industry	130	489	1,221	2,093	2,371	4,853	8	13	21	49	37	46
Transport and communication	-	23	16	202	336	395	-	1	0	5	5	4
Trade	296	886	915	350	297	347	18	22	15	8	5	3
Banking	24	57	54	23	44	41	1	1	1	1	1	0
Education	835	1,370	2,353	414	559	1,165	52	35	40	10	9	11
Government professions	336	982	1,349	1,164	2,496	3,767	21	25	23	27	39	36
Unknown	-	110	10	-	277	12	-	3	0	-	4	0
Total	1,621	3,897	5,918	4,246	6,380	10,580	100	100	100	100	100	100
Of which: graduates of a Dutch University	1,540	3,455	5,641	3,520	5,652	9,356						

IX. GRADUATES OF THE FACULTY OF MATHEMATICS AND SCIENCES

Table 6 provides some information on the stock of graduates of the faculty of mathematics and sciences and the number of engineers with a breakdown to major economic sectors.

It may be noted that the big difference in percentage employed in industry which existed in 1930 has diminished considerably showing increasing opportunities for scientists in industry.

Some information about the ratio of stock of scientists to stock of engineers is presented in table 7.

Table 7. STOCK OF GRADUATES OF THE FACULTY OF MATHEMATICS AND SCIENCES AND STOCK OF ENGINEERS, 1930-1980 a)

		1930	1947	1960	1965	1970	1975	1980
Industry								
scientists	(1)	130	489	1221	.	.	.	.
engineers	(2)	2093	2371	4853	.	.	.	.
	$\frac{(1)}{(2)}$	0.06	0.21	0.25	.	.	.	.
Total								
scientists	(3)	1540	3455	5641	7200	9500	13100	17700
engineers	(4)	3520	5652	9356	11300	13600	18000	23400
	$\frac{(3)}{(4)}$	0.44	0.61	0.60	0.64	0.70	0.73	0.76

a) 1930-1960 Census; 1965-1980 according to supply calculations.

There is a remarkable increase in the number of scientists employed in industry as compared to that of engineers. During 1930 and 1947 a fast increase can be noticed, between 1947 and 1960 a slow one. This is correlated with the total number of scientists as compared to total number of engineers. This together with the future increase of total numbers of scientists compared to that of engineers, suggests that industrialists will make use of the opportunity to employ relatively more scientists as compared to engineers. This will reduce the demand for engineers which was calculated without taking into account the development in the stock of scientists. This suggests that the expected supply of engineers will be reasonably sufficient to match demand.

X. SUMMARY AND CONCLUSIONS

In the analysis given above it has been tried to relate the demand for engineers to indicators of economic growth (production volume, productivity, investment). No satisfactory relations were found except of global nature which can be regarded as trend or scale correlations of doubtful theoretical value. Therefore it has been preferred to assess the demand for engineers by simple "extrapolation with phantasy" (extrapolation brutale) of densities. By what factors the demand for engineers is determined remains obscure. The forecast can still be seen as a demand forecast if the simple truth is accepted that a reasonable development in the past, if continued, may be thought to give a reasonable assessment of what will be required in the future. The fact that a judgement to what extent the development in the past has been satisfactory is necessary, introduces an extra arbitrary element in the forecast.

When looking at past development in the ratios of college engineers to university engineers and at the differences in these ratios among the various fields of study, one is inclined to think that there is possibly a great amount of flexibility in the pyramid of technical personnel. Therefore no arguments could be found to alter the assessment of the demand for engineers.

The development in the ratio of scientists to engineers suggests that employers will seize the opportunity to employ relatively more scientists. This would reduce demand for engineers and the possible shortage of engineers could vanish. This suggests that supply of engineers will match demand. This in turn leads to the positive conclusion that expansion of training capacities, to the same extent as the number of students will increase, is necessary.

Given the fact that no stable relations could be found the outcomes of the forecast should not be regarded as giving strict targets for educational policy makers but as tentative and global indications of a desirable development.

FOURTH TOPIC

COST AND FINANCING OF HIGHER EDUCATION

RECORD OF THE DISCUSSION

1. THE ACCOUNTING PLAN, AN INSTRUMENT FOR THE ANALYSIS AND FORECASTING OF EXPENDITURE

Mr. Debeauvais listed the difficulties encountered in attempting to interpret available statistics of expenditure on higher education, particularly for use as a basis for forecasting.

However, the need to programme future expenditure on higher education over several years to meet the rapid growth in students numbers, has led some countries to improve their system of accounting.

In Belgium, for example, the Conseil National de la Politique Scientifique (C.N.P.S.) produced, two years ago, a "standardised accounting scheme" to record all expenditure on university education. Its aims are threefold :

- To standardise the recording of expenditure: this is particularly necessary in systems as higher centralised as that of Belgium where government subsidies account for a steadily increasing share of the "free" (i.e. denominational) universities' expenditure.

- To keep track of changes in the distribution over time of expenditure on the various items in the education budget, i.e. as between faculties and disciplines, teaching and research, different cycles of study, etc. thus making it easier to determine "drifts" in expenditure and likely future trends.

- To establish "unit costs" and determine the factors which influence them; for example, by comparing unit costs for university for the same discipline or faculty and seeking to explain the large-scale divergencies usually observed(1); an analysis of this kind would also suggest certain ways in which expenditure might be more efficiently allocated.

---

(1) See, inter alia C.P. Van Dijk : "The Operating Costs of Education" published in "Lectures and Methodological Essays on Educational Planning, Document Series, O.E.C.D. 1966".

While acknowledging the value of an accounting scheme of this kind, certain participants, such as Mr. Eicher, emphasised its limitations. The true cost of education to the community is in fact far higher than that recorded in the budget for this level of education. To get an idea of the true cost information would be needed on:

- the cost borne by individuals; in Belgium, according to Mr. Laderrière (1) the costs borne by students' families still represent about one-third of total expenditure on higher education (including expenditure on students' keep);
- opportunity cost: mainly the potential earnings a student foregoes in order to study.

It is obviously this economic cost which should be taken into account in assessing the most efficient way of utilising resources.

The unit cost concept must allow for a distinction between unit operating cost and unit capital cost: however, the latter relates only to new building and equipment.

A French survey to which reference was made in the course of the discussion (2) attempted to calculate the incidence of drop-out on unit operating cost and the relationship between the latter and the size of the faculty. The hope was expressed that many more surveys of this kind would be made on cost per graduate as they provided an assessment of the educational output of the various establishments.

Stress was also laid on the need for a distinction between the cost of education as opposed to the cost of research. In the Robbins Report (United Kingdom) and the "Inventaire du Potentiel scientifique de la nation" (Belgium), an attempt was made by means of a questionnaire to determine the number of hours spent on research by teaching and scientific staff. This distinction is fundamental particularly when comparing unit operating costs for the various faculties and branches of study.

---

(1) P. Laderrière: Essai d'analyse du financement de l'enseignement Universitaire en Belgique (tentative analysis of the financing of university education in Belgium): O.E.C.D. (Directorate for Scientific Affairs).

(2) J. Lecaillon: Le coût de l'étudiant en droit et sciences économiques (Cost per student in law and economics): Revue de l'Enseignement supérieur: 1963, No. 1.

The O.E.C.D. Handbook of Methods and Statistical Needs for Educational Planning includes a chapter on methods of analysis and projection in connection with educational costs.

2. AID TO STUDENTS

The discussion which followed Mr. Laderrière's paper emphasised the difficulty of specifying the objectives of aid to students: it is no longer clear whether the basic objective of this aid is to create equal opportunities of access to higher education or merely to "facilitate" the work of the students and give them a certain social status.

At the present time, indirect aid (lodging facilities, university canteens, family allowances for children continuing their studies, etc.) is clearly becoming an increasingly important item in total aid to students. The question was raised whether this development was desirable in as much as these forms of non-selective aid mainly benefit students from well-to-do families.

Would it not be preferable to increase the aid granted to poorer students and to arrange for the many services available to be charged at cost price without distinction to all students? Or perhaps make indirect aid proportionate to the resources of students in the various categories? Certain experts argued that equality of opportunity which is essential if education is to be made really democratic implies considerable inequality in the provision of aid.

It was pointed out, however, that in this case aid was most needed at secondary level since family circumstances are more likely to influence selection at this level than at the more advanced stage. Moreover, the obstacles are not solely financial; certain surveys have shown that obstacles to access, and particularly failures in higher education, are due to cultural differences far more than to differences in income. Should this not be taken into account in the type of indirect aid to be allocated?

Mr. Eicher emphasised that the amount of aid should be based on an objective analysis of trends in the composition of the student's "real budget" and the factors which influence it. One survey has shown that a student's expenditure depends in the main on his income, his cultural background and the distance between his home and the university. The disadvantages of setting up a "campus" some way out of town were also noted: it appreciably increases students' expenditure. If the campus is non-residential travelling costs are likely to be higher. Even when students live in the campus, trips to town are a source of expense.

The problem of selective aid was also discussed: should the award of aid be contingent on the choice of certain subjects, in the light of the country's manpower needs? Certain countries seem to be heading in this direction, particularly to promote the recruitment of teachers. This may be regarded as a blow at the principle of the free choice of subject, even when a student is given the alternative of refunding the aid he has received in order to free himself from his undertaking.

On the other hand, there seems to be a more favourable response to the idea of selective aid based on examination results or educational level. Study grants may be increased for students who already have a first degree or may even be brought up to the level of a salary. It was pointed out in this connectionthat the democratisation of education means not only giving all classes of the community a fairer share in education at all levels but also and above all ensuring a more effective selection of abilities irrespective of social background.

It will undoubtedly be necessary to think out new forms of aid and methods of financing aid in view of the increase in the number of students. In Sweden for example, an educational grant consists of two parts, one refundable (i.e. a loan) and one which does not have to be reimbursed. According to Mr. Praderie, it might be possible to envisage a "scholarship fund" to which industrial firms might contribute on the lines of the apprenticeship tax.

3. THE FINANCING OF HIGHER EDUCATION

Mr. Debeauvais emphasised the difficulties facing educational planners when assessing the incidence of the various factors which will influence the cost of higher education in the next few years.

On the one hand, the cost of higher education has risen so fast in most countries during the past few years that it can hardly be expected to continue to do so much longer. There is little point therefore in projecting pasttrends for the future. On the other hand, the foreseeable increase in the number of students combined with the steady rise in unit costs (increase in the salaries of teacher, increase in the cost of research, "drift" of students towards scientific, technological and post-graduate studies, etc.) should lead to a considerable increase in expenditure. It may, however, be assumed that the increase in public expenditure on higher education is bound to be kept within "tolerable" limits which will be lower than in the past few years. When working out their forecasts of educationalexpenditure, planners must take account of the needs of the economy as a whole.

This analysis having been approved by most of the participants, ways had to be considered of maintaining public expenditure within these "tolerable" limits without jeopardising the future development of the educational system.

A first possibility would be to try to raise additional funds by getting industrial firms and students' families to contribute more. But some experts were sceptical or had doubts about this. New taxation is hardly the answer as this would raise the more general and complex problem of overall taxation.

Another possible solution to the problem of financing higher education is a thorough overhaul of teaching methods.

Governments and educational authorities are increasingly realising the need for a thorough investigation into possible new methods of the education. It was pointed out that education has so far been one of the sectors whose investment in research into its own procedures has been lowest in proportion to its resources and that higher education does very little research on itself.

It may also be hoped that the next few years will see radical changes in ways of acquiring knowledge.

A more effective selection of abilities would check the steady rise in operating costs and lead to a reduction in the present very high cost of drop-out.

A type of rationalisation which could fairly easily be introduced is the fuller use of premises over the whole year: this is already being increasingly done in American universities.

These educational prospects have not yet found ready acceptance and most participants drew attention to the considerable force of inertia in the educational system and tended to take a pessimistic view of the possibilities of any radical change in the near future.

REFLECTIONS ON BELGIAN EXPERIENCE IN COST ANALYSIS AND FINANCIAL FORECASTING

by

Dr. SPAEY

I am speaking to you as one of those responsible for science policy and not as a theoretical economist. My attitude will therefore be slightly different from that generally found in scientific publications on the economics of education. I am interested mainly in the statistical data on which a rational policy can be based.

In the first place I believe that it is not essential for a leader of science policy to use such concepts as costs, profitability, productivity, etc. as rigorously as they are used in economic theory. For instance, we cannot expect economic theory to define for us exactly the cost of education, or the extent to which it must be regarded as a consumer good, or what precisely constitutes the "output" of educational activities. We have to deal with these problems, whether we like it or no, or whether we have or have not all the necessary conceptual explanations or the factual data available.

It is quite likely that our main interests are not the same as those of economic theory; for instance, the question of ascertaining what proportion of the national product is represented by the costs of educational factors does not interest us particularly, because it does not really enable us to draw any significant conclusions at an operational level. Moreover, controversy still reigns among the theorists as to which are the non-monetary costs of education to be considered as an integral part of the national product.

One further fact should be kept in mind: economic theory has as much to learn from practice as practice has from theory. I hope to be able to show later, how, as a result of practical experience, we ask the theorists about problems they may be inclined to find less important but which, after all, constitute the raison d'être of economic science.

So you must not expect from me a table of the statistical data we think it useful to collect; this work has already been done in a number of excellent publications and lectures, including those of O.E.C.D. My purpose is rather to outline, in the light of our few years of experience in Belgium and particularly in view of what we want to achieve in the future, the main questions of science policy to which we hope to find an answer with the help of the statistics available.

+

+ +

I. Science policy - as distinct from theory - requires data on financing and costs for two purposes:

- first, for the forecasting and possibly the planning of future demands on the public purse,
- secondly, to control the economic efficiency of the educational system, i.e. to assess the profitability of the efforts to be made to expand this system.

It is the first of these aims which particularly attracts attention. I shall show later why I think that the second, which is just as important, should be combined with the first. But in the first place, these two aims call for the same statistical basis, namely, a rational and precise description of the existing situation. This modest task, however, holds some surprises and difficulties in store for us, even if we limit ourselves to a simple description of the public financing of higher education.

In Belgium the State universities are financed almost exclusively by the State and the denominational universities also to a large extent. Funds are provided, as a rule, by the Ministry of Education. Under the science policy budget in the Belgian State budget, a very detailed analysis has been made of all expenditure on higher education and basic research, great care being taken to identify, for each item, the final consumer of the appropriation made.

This analysis shows that the Belgian universities are in fact financed to a large extent by a number of other departments, particularly their research activities. I refer in particular to the Department of Economic Affairs and the Department of Public Health.

This may be considered as being more a question of financing activities not necessarily of direct benefit to higher education, as for example research activities not relevant to the teaching functions of the university. This may be true to some extent. I shall leave open the difficult question of which sectors do or do not serve the interests of higher education.

I wish simply to observe that such activities are also financed in the ordinary way under the appropriate Budget section of the Ministry of Education. "Pecunia non olet" says the Latin tag, and for this reason all university income should be included in the description of the system of financing. This does not apply solely to Government expenditure, but also to all university income including remuneration for equipment and services rendered.

The university may be likened to a firm producing a multiple range of goods: it produces not only education (i.e. the total services required to turn out a graduate) but also numerous other services and even equipment, either systematically or sporadically. The most striking example is a teaching hospital attached to the Faculty of Medicine, which not only trains future doctors, but also accepts patients for examination and treatment.

For those concerned with science policy, it is sound and rational to wish to obtain perfect correlation between the desired aim, the source of financing and its practical utilisation. In fact, it is not possible to know the cost of an activity - still less its profitability or productivity - if we do not know exactly what proportion of funds is actually devoted to it. Moreover, we know from experience that when finance is not channelled directly problems arise with regard to final aims, administration and even teaching methods.

I could illustrate all this by numerous examples from our experience, but it is enough to say that so far our efforts have been mainly concerned with bringing light to bear on the ways of financing. This work, though apparently modest and not very original, is nevertheless of value since it enables us to set up policy machinery adapted to each activity, and an ad hoc channel of financing. We have thus made some progress in Belgium, towards the use of a single procedure for evaluating, financing and controlling all publicly financed basic research carried out in the universities, regardless of the department from which these funds are derived.

I should like, in our subsequent discussion, to touch on the question of the extent to which we know and control the complete Government financing of university education in the various countries.

+

+ +

II. I now should like to talk about the need to have statistical data in order to forecast future needs. I shall not stop here to discuss the form in which the results of such forecasting will influence science policy, i.e. whether in the form of planning or programming, or not at all. But one thing is obvious: "it is very difficult to foresee the future".

Each forecast, however refined it may be, is no more than the best approach to a future situation, subject to a number of important factors remaining unchanged, or evolving in a well-defined direction. We do not know whether most of these factors will change, and if they do, in what direction. Science policy will try to influence these factors, but there is some uncertainty as to the possibility of its being able to do so, and also of what is to be forecast.

Let me give an example: many forecasts of the future number of students in Belgium are based on the assumption that the coefficient of transfer from secondary to university education will remain the same, or evolve according to a certain trend. Previous observations, however, have revealed that, in order to forecast the future number of students, we must first specify the functional relationship existing between the total number of secondary pupils and the number of university students and, secondly, be prepared to accept a margin of uncertainty.

Transfer from secondary to university education is strongly influenced by political factors of all kinds. In Belgium, an act was recently passed recognising equivalence of secondary school certificates and this will allow pupils in most secondary streams to have direct access to all university faculties (except engineering) on passing a matriculation examination. All forecasts to date have been based on the situation existing before the passing of this act. In addition, we do not yet know exactly what effect this act will have on transfer coefficients.

I wish simply to show that it would be presumptuous to expect to forecast the number of students in 1980 once and for all, and to draw up a development programme accordingly. We must collect the statistical data and integrate them into our policy in such a way as to be able, if necessary, to redirect our action as a result of any changes in the aims, means or situation.

All forecasting or planning in higher education is based on a physical estimate, usually relating to the number of enrolled students, but sometimes to what the Robbins report calls the "demand for places". Obviously, this attitude presupposes a more or less limited "supply" of places, whether for legal, or economic/financial reasons.

In Belgium, public opinion is convinced - even if it does not always say so - that the growing demand for university places should be met and that adequate financial resources must be found (cf. the first act on university expansion, in April 1965, which explicitly provides for a second phase starting in 1969). It is the preparation of this second stage that is at present occupying, side by side with the political bodies, the organisations dealing with science policy in Belgium. We feel sure that our leaders will remain faithful to this conviction.

The discussions of the past few days have shown that there are various ways of approaching the problem of forecasting the number of students, the methodological difficulties, and the extent to which the results of the various approaches may differ. As my own starting-point is that one cannot forecast the future, I do not consider these differences a handicap. If the various metholologies are not successful and if, as a consequence, we have to provide the politicians with the results of two or more different forecasts, I do not consider this an obstacle to rational action either - quite the reverse. We must be content with such a situation, but on two conditions:

1) that the data and statistical units must be perfectly comparable whatever the differences in the forecasting method used;
2) that it is possible to up-date the forecasts regularly whenever necessary (i.e. as a rule, once a year) in the light of new data.

The National Council for Science Policy will not attempt to make any definitive forecast which would render any subsequent action unnecessary. We shall contribute to methodological debates, as we already have done, and then in our planning we shall make use of any method according to its merits.

Let me digress here and make a few remarks about the information value of student population forecasts. I wonder whether the considerable and justified effort we make to forecast the number of students has not diverted our attention from all the factors influencing the student at the time he makes his decision to go to a university and in his choice of a particular branch of study. We estimate the approximate number of students to be expected, even per subject, but we have still no complete survey of the factors which it would be possible to influence, in order to increase or decrease that number. Progress is being made in this field by means of special studies of stratified samples, but at present we have not even a rudimentary decision model available. This is all the more surprising since the statistical data to test such a model are available in quantity, or are at any rate easy to collect.

However, the forecast of the number of students remains the cornerstone of any estimate of higher educational expenditure or costs. It may be obtained by a simple method consisting of examining the previous trend in outlay per student, extrapolating the future cost per student from this trend and multiplying it by the expected number of students.

This method, which is admittedly over-simple, should not be rejected when no more than a provisional estimate of the future trend in public educational expenditure is required. It does however lack precision; a number of important points are not covered, for instance, the proportion of private financing, the variable proportion of research and other activities whose price indices may very well evolve differently from those of the "teaching" side, the weighting factors which should be attached to the various fields of study and levels of education, etc.

Even if we can say that we know the "financial cost per student", this can be only the average cost. But the economist and the politician are more interested in the extent to which average cost differs from marginal cost.

It is no doubt superfluous to stress these facts before such a specialised audience, but I wish to draw your attention to the way in which marginal cost should be calculated. Marginal cost is not the cost corresponding to the chronological increase in the number of students from one given year to the next, even if that increase were to be marginally small.

Marginal cost is the additional (supplementary) cost incurred by the enrolment of one more student in a given year. This difference is important because the increase over time in cost per student in institutions enrolling an ever-increasing number of students might lead one to think that these institutions had grown beyond their optimum size. I have spoken so far as though the public financing of university education represented our sole statistical problem, which is not the case. For universities with a certain measure of autonomy, or tending to acquire it, it is more difficult to obtain an overall picture of income and expenditure. This is however a sine qua non, especially in a country such as Belgium where universities have different statutes and consequently have different means of financing.

The act on university expansion made it compulsory for all higher education establishments to observe a uniform accounting system covering all expenditure, including the reserve for the renewal of buildings.

Expenditure, including that not covered by the State, will be broken down by type (personnel, operating, equipment) and by Faculty as far as possible.

Universities and related institutions must prepare an annual financial report.

Our information on the use of such methods in other countries is insufficient to permit comparisons, but we feel that such an accounting plan offers the dual advantage of covering public expenditure and also of explaining total expenditure. As this plan has been in use only this year, it is too soon to judge its value and utility.

Meanwhile, it would certainly be interesting to ascertain - possibly in our discussion - how universities justify their expenditure in other countries, whether they are obliged to provide such justification and whether this can be done according to function.

I suppose that in general there is some official procedure for drawing up the budget and for its financial control, especially for foreign universities.

What other possibilities are there of using these relatively detailed financial accounts?

In the first place, they offer the possibility of assessing unit outlay, that is, of assessing costs in as detailed a manner as breakdown permits, i.e. by field of study and by level.

A series of such data is always welcomed by educational economists.

In future, we shall first of all be faced with an overall increase in costs, for the classic economic reasons of the acute shortage of the resources required in higher education. Secondly, we can expect a significant change in the cost structure of university education caused by a shift towards far more costly fields and levels of study. If, for example, we give priority to the expansion of the pure and applied sciences, or if we increase the number of post-graduate courses, this means that we are moving into fields where the outlay per student per year is 10 times higher than it is in the less expensive faculties eg. the first year of law.

This refinement of statistics is essential, even for the near future, if we want our financial forecasts to have some realistic basis. Obviously, this means that the projection of the number of students must be as detailed as the financial data. It is highly probable that if the financial data are so detailed, we shall know more exactly the nature of research costs in higher education.

The factors of production of education remain reasonably homogeneous and may be reduced to a few main categories: staff qualified up to various levels, books, equipment for demonstrations and practical work, operating and administrative costs.

I am fully aware of the fact that this list will have to be lengthened in future by the addition of what at present seem exceptional items of expenditure, e.g. closed-circuit TV or the hire of computers, but on the whole such items can be easily integrated and their trend in costs calculated without difficulty. The same cannot be said of research. The equipment and tools used and the variety of skills called for here are extremely diverse and often depend on technical developments which are often unexpected; they may also be connected with changes in the actual aims of science. It is typical that a recent American report on the chemistry situation concluded that it would be useful to have a "crash programme" on the use of computers in university chemistry departments. Ten, or even five years ago this was unthinkable.

For all these reasons it is difficult to integrate forecasts of research costs with the forecasts of finance for higher education. It would be possible to establish an index of research costs if we could overlook the objections I have just raised and if - as is possible for strictly educational activity - we could divide expenditure by the amount of output.

Only as you all know, the calculation of research output is still the major problem of science statistics and moreover a difficult one to solve.

This makes the establishment of a valid index of research costs a complex task. Future research forecasts must therefore be formulated in less refined and more "normative" terms, for example research expenditure could be forecast on the basis of a constant or increasing percentage of the total university budget. Meanwhile there is the question of method and the more fundamental question of ascertaining how much research should be carried out in the university and why.

We could probably all benefit from a comparison of our experience in and our philosophy on this matter. By your leave I shall refrain from dealing with the question of how far buildings, heavy equipment, and even the time of academic staff can be considered as part of the teaching function or the research function or possibly other functions of the university, because that question can be solved inside each institution by means of an appropriate administrative and accounting technique.

Assuming that we have reliable, comparable and sufficiently detailed statistics of university income and expenditure (broken down according to the main functions of teaching and research) we might make our forecasts by formulating simple assumptions about the future behaviour of unit outlay and the units themselves. Lastly, by multiplying projected unit costs by the number of units projected, we obtain the financial forecast.

In itself this is a satisfactory result, but, as it is based on unit costs, i.e. on average costs, the analysis lacks consistency. Real economic management dealing with the efficient distribution of limited resources in order to achieve a given purpose is not fully shown here. Calculations using average costs presuppose the optimum allocation of limited resources and the maintenance of this assumption in future; but this will probably not prove to be the case.

Purely economic efficiency consists in achieving a given target (e.g. training 10,000 more graduates per annum) by utilising resources in such a way as to maintain costs at a minimum, or conversely to train the maximum number of graduates on a given annual budget. I think that our plans for university expansion have not taken sufficient account of this more strictly economic view of the problem. In any case I should be extremely interested to know if such has been the case elsewhere.

Theoretical economics may appear too abstract for its argument to contain any direct stimulus to action. In this connection I should like to ask you a few questions clarifying the type of problems which may be considered and even solved if adequate economic and financial statistics are available.

Is the existing ratio between expenditure on academic staff, administrative and technical staff, buildings and equipment to be regarded as an optimum? In other words, can we replace one teacher and a large class by a combination of junior staff, smaller classes and closed circuit TV?

Would it not be less expensive (and perhaps offer teaching advantages, but here we are getting out of the sphere of economics) to replace academic and junior staff by a central computer for certain practical exercises? Do we know what is the exact budget that should be distributed annually for scholarships (and their average amount) in order to achieve optimum use of existing or planned university institutions? What is the purely financial cost (as opposed to the social or cultural cost) of maintaining the existing network of university institutions as compared with a more decentralised system? Or as compared with a more centralised system?

In order to answer these questions, i.e. to make a true cost/benefit analysis of higher education, we cannot be satisfied with a mere description of the existing situation or with simple calculations of marginal costs based on the assumption that existing factor combinations will remain valid in the future. It is necessary to verify the full range of different possible combinations of expenditure items (e.g. staff, buildings, teaching equipment, etc..) that can turn out one particular product (e.g. a university graduate) and represent them in algebraic, graphic or even only accounting form. The economist would say that it was necessary to know the "production functions" of higher education or the identical production levels.

It is clear that this calls for statistics of quite a different type from those to which we are accustomed. Somehow or other, we must try to determine what other method might be used for distributing total public and private expenditure so that output and productivity could increase without necessarily increasing total cost. Such data cannot be collected without the active collaboration of persons closely concerned in university policy. We shall eventually be forced to undertake this cost/benefit analysis for two major reasons. In the first place, economic theory teaches us that, of two methods producing the same end-product, we must choose the less expensive. For those responsible for science policy this means obtaining optimum results with the available budget. Secondly, I foresee that in future, higher education will absorb an increasing proportion of the national product. One result of this will undoubtedly be that this item of the budget will be subject to increasing competition from other items (health, defence, research, etc.) and will thus be exposed to dual pressure - it will have to justify itself in the face of these competitors and also have to make the best use of its relatively limited resources. I am fully aware of the main objection to this view, namely that economic considerations may thus take precedence over pedagogical, cultural, or even purely human considerations. This is not an imaginary danger, but it can, in any case, be avoided. It is not for the economist to lay down the law as to the "best" solution to those who are responsible for defining science policy.

The economist's basic task is to determine the financial and other non-apparent costs of possible combinations of production factors and to submit them to us. If this shows that certain specific solutions are more costly than others, those responsible for science policy must examine these additional costs from the more human aspects of the question.

They will have complete freedom of decision, but they will know the relative costs of the alternative solutions. The main objection to the application of a cost/benefit analysis to higher education is a practical one, namely that the statistics at present available do not permit such an analysis. In the discussion it will probably be of interest to consider how far financial statistics can be adapted to this purpose and whether any attempts to do so have been made so far.

I shall end with one question: how can using the forecasting approach be brought into step with the aims of economic efficiency? It seems a little weak merely to project our cost situation into the future on the assumption that unit costs will remain constant or will change proportionately. We must improve our knowledge of some of the constituents, factors that are combined to produce the output "education".

On the other hand, it scarcely seems reasonable to analyse the economic efficiency of the existing situation if we do not draw any lessons from it as to the optimum future distribution of available resources.

COST AND FINANCING OF HIGHER EDUCATION

by
Mr. DEBEAUVAIS

If one assumes that the pressure of "social demand" for access to higher education is likely to increase during the next few years, and that current reforms in secondary and higher education in European countries will reinforce this trend, it becomes necessary to consider the financial consequences of this expansion. The fact that economic growth and technological progress will call for an ever increasing number of highly qualified executives and senior technical personnel is not in itself sufficient to justify an unlimited increase in educational expenditure; nor is it enough to say that education is a highly profitable investment, as this is an analogy rather than a working concept. The purpose of a plan, or more generally, a policy for development, is to review all the community's requirements, to ensure the best possible distribution of invariably limited resources. There is therefore no "absolute priority" for education, as all priorities are relative.

The pragmatic approach, that of the administrator rather than planner, would be to begin by forecasting the number of students as determined by the demand for education and manpower needs, and by estimating the cost of the measures proposed, and then consider how the expansion of higher education can be financed; in practice the problem is frequently dealt with in this manner. But from the standpoint of economic theory, it would be best to begin by trying to estimate the optimum amount of resources to be used for developing higher education.

In this connection it may be well to distinguish between several concepts which in practice are apt to be listed indiscriminately under the general heading of "financial questions".

I. EXPENDITURE, COSTS AND FINANCING

1. There is, first, the concept of educational expenditure, i.e. the recording of all items of direct expenditure committed for educational services constituting a branch of services in the national accounts (1), usually under the heading "government departments".

Once one has established the breakdown of "total expenditure on education" by level and type of education, one can proceed from the branch to the establishment or to the pupil in order to estimate what are known as unit costs but which should rather be referred to as "costs per pupils" for each division of the educational system. This is an accounting concept rather similar to that of "cost of production" or "cost price" for a commercial undertaking, although with the essential difference that educational services have no "selling price" in the usual sense. Planners need to know these costs per pupil in order to estimate expenditure on education in relation to numbers forecast. But it should be emphasised that these costs are almost always calculated on the basis of public expenditure, which leads to a number of difficulties:

a) Budgetary classifications follow public accounting procedures, which must allow for parliamentary and administrative controls: it is often difficult to identify types of expenditure or transactions,in order to estimate the cost price. For example, teachers' retirement pensions are often included with those of civil servants generally; subsidies for private education are not always broken down by level or type of establishment; subsidies from the central Government to local authorities are sometimes lumped together, which makes it impossible to identify the share allocated to education; actual expenditure does not always correspond to the budget approved at the beginning of the financial year, and the final accounting is often delayed and may take a very general form; investment expenditure is sometimes included in the general budget and at other times shown separately in a capital budget which is difficult to interpret: in the French system, a distinction must be made between expenditure authorised for pluri-annual programmes, commitments, and actual disbursements.

---

(1) Concerning the difficulties of dealing satisfactorily with the Education branch in national accounts, see: Jean Marczewski, "La comptabilité nationale" in "Traité d'Economie politique", Dalloz, Paris, 1960, pages 619 to 621. The O.E.C.D. Handbook, "Methods and Statistical Needs for Educational Planning" Paris, 1967, contains a series of 5 double entry matrices showing the allocation of expenditure on education for the purpose of national accounts (pages 285 to 313).

b) Owing to the lack of data concerning expenditure on private education, it is usually assumed that unit costs here are identical with those for public education, a conclusion which is contradicted by the few partial studies that have been made. Seldom can this deficiency be remedied by estimating the "resources" of private education. While it is usually possible to determine the amount of public subsidies by examining budgets, this is not true of such actual resources as fees, grants, income from assets, loans, etc. At best, therefore, the data available apply only to public expenditure on education.

c) Allowance is hardly ever made for the annual depreciation of buildings and durable equipment; to remedy this to some extent, a distinction is generally made in plans between the two concepts of unit operating costs and unit investment costs corresponding to the expenditure involved in creating a new place; but this twofold character makes it impossible to interpret unit costs as a satisfactory approximation of the cost price.

2. Costs

The measurement of expenditure on education and the assessment of cost price are questions properly belonging to accounting technique. For the economist, it is the concept of the cost of education that is important, especially if it can be set against a concept of output. The concept of cost is wider than that of expenditure, which is no more than the monetary expression of the resources actually devoted to education; to determine the optimum distribution of resources, which is the principal concern of the economist, other possible uses of these same resources which could be or could have been more or less profitable must also be taken into account. This is the economic concept of "opportunity cost" which is applied to education when estimating the potential earnings lost by students who forego any salary for the duration of their studies. This type of classic economic analysis is sometimes applied to higher education; an estimate being made of the "profitability" of education by comparing the "cost of higher education" (direct and indirect expenditure by individuals and the community), plus the loss in potential earnings) with such subsequent profits as those provided by the higher salaries obtained during working life as a result of additional education (taking into account retirement benefits where appropriate). It is well known that the principle (or for some the assumption) on which this calculation is based is that each worker is remunerated in terms of his exact contribution to output, at least in a situation of ideal competition; if differences in wages reflect differences in productivity, it is possible to measure the profit which an individual receives from his earlier education, or in global terms the gain to society as a whole from educational expenditure. The rate of profit is that which equates the present value of future differential wages with the costs of education; expenditure on higher education will be "profitable" so long as the rate calculated in this way is higher than the average rate of interest or the rate of return from other types of investment. This is not the place to discuss such calculations of economic returns and their theoretical basis. The assumptions which give rise to most controversy are of course: a) the principle of equality in the marginal salary as related to marginal productivity, b) an ideally functioning education market (i.e. equal opportunity of access, c) identity of the gain for the community with the sum of individual gains, d) the lack of statistics, e) the existence of a satisfactory correlation between levels of wages and the education received by workers (1). But even on the basis of all these assumptions the rates of return calculated in this way could provide too little information for planning purposes. It is not enough to know whether expenditure on higher education (or some particular branch of higher education) is inadequate, satisfactory, or excessive in relation to the average date of interest. It is still necessary to determine the level of long-term equilibrium in order to judge the extent of efforts required for higher education.

3. Financing

Although no country has yet based its decisions on such calculations of profitability, several are now beginning to forecast manpower requirements by level and type of occupational skill so that priorities can be determined for promoting higher education. The aim of this method of approach is to fix precise objectives for enrolment in each branch and at each level. It cannot however be applied easily to questions of financing. Neither the theories on which forecasts are based nor the statistical data concerning the occupational and educational structure of the labour force are sufficiently reliable. With the limited information at present available even those most strongly in favour of forecasting manpower needs would hesitate to claim that the production objectives of a plan could not be met unless the corresponding educational objectives were achieved. The need is for figures indicating training requirements that would be considered acceptable rather than an accurate assessment of possible bottlenecks on the labour market. The point of view of the economist is thus very different from that of the accountant (whether private or national), since the estimate of direct monetary expenditure is but one factor of economic cost, and determination of the volume of financing desirable calls for a criterion concerning the effectiveness of expenditure. But we have just seen that economic theory is still ill-equipped to provide criteria for financing applicable to educational expenditure, no doubt because until now too little attention has been paid to the qualitative structure of labour. Economic analysis of the education sector is made even more difficult by the fact that there is no market price set for this service, so that its distribution is not governed by the usual market laws. It is, paradoxically, a service for which demand increases spectacularly while this fails to be reflected by any rise in price, or by any increased propensity on the part of individuals to increase their expenditure on education; it will instead be noted that even in those countries where higher education has never been regarded as a free service (the principal examples being the United States and the United Kingdom), the share of private financing, whether in the form of fees or private resources, is continually decreasing and now accounts for but a very small proportion of total expenditure. This is an essential factor which the economist can but record as an external element which he is not in a position to change: modern societies appear to demand both a considerably increased capacity of the higher education system, and financing which is entirely or almost entirely public. The criteria for determining the level of financing desirable must therefore be sought outside economic theory and practice. It is in fact a question of allocating budgetary resources, and it is likely that decision-making processes by which credits are granted for higher education go beyond technical aspects. Among all the factors which influence these decisions (which to date have been little studied) there must be many social factors, the main one no doubt being the increasing demand for post-secondary education, which Professor Stone has compared to the spread of an epidemic. And since the financing of education raises problems which are almost exclusively bound up with budgetary decisions, consideration should be given to governmental processes, including the way in which decisions are taken in connection with public expenditure. For example a factor which might be classed as an institutional constraint is the tendency to allocate budgetary resources on the basis of appropriations for the previous year (1), which prevents over-rapid increases in finance for higher education, even in the event of an acute shortage of technicians or engineers. It is moreover possible that the recent growth of higher education is due to the increasing pressure of demand by the population even more than to the economy's increased need for key personnel. It may be noted in this connection that rates of increase in student numbers do not seem directly related to respective rates of economic growth in the various European countries.

---

(1) In calculations of profit earning capacity so far made, median wages have been used for each level of education, without allowing for dispersion above and below the median; this is however likely to be an essential factor in influencing the accuracy of results.

---

(1) In France, budgets are submitted to Parliament under two headings: "renewal of previous budget" and "new measures" which are the only ones discussed. Existing situations have more weight than new requirements and this lack of symmetry is an obstacle to adjustment.

If this social demand factor is so important, forecasts relating to the financing of higher education should take much closer account of the different factors influencing the demand for education (1). As a first approximation, only a few aspects of the recent trend in student population and expenditure on higher education in a number of O.E.C.D. countries will be analysed. This will not consist of any systematic analysis but rather of a general interpretation of the partial data the author has been able to collect, chiefly by consulting national documents and available O.E.C.D. (2) statistics.

II. RECENT TRENDS IN EXPENDITURE ON HIGHER EDUCATION

Table I compares the recent trends of expenditure on higher education in 15 countries with trends of public educational expenditure as a whole and student numbers. As the time series available did not cover the same years, these trends are shown in the form of annual growth rates, assuming regular geometric growth between the beginning and end of the period. This simplification has several drawbacks: closer examination of the basic data shows that growth is irregular and that the annual growth rates calculated in this way are overdependent on the choice of reference years, which is arbitrarily determined by the availability of data. To remedy this to some extent, long series have been divided into shorter periods of four or five years; it is thus easier to see the changes in growth rates in recent years; use has also been made of complementary data relating to slightly different periods so as to test the sensitivity of the indicator of growth chosen as well as any

---

(1) "Social demand" for education could also be described as the "educational supply" or "graduate supply" since, once education is completed, a supply becomes available on the labour market.

(2) I would like to thank Mme.Solliliage and M. Hecquet for providing me with a large number of basic statistics which I have used to draw up the following tables.

Table 1. TREND OF PUBLIC EXPENDITURE ON HIGHER EDUCATION COMPARED WITH THE TREND OF TOTAL PUBLIC EDUCATIONAL EXPENDITURE AND TREND IN STUDENT NUMBERS

(average annual percentage increases)

		1 Public expenditure on higher education	2 Total public expenditure on education	3 Increase in student numbers
AUSTRIA	1956-63	12.4 %	7.2 %	13.2 %
Forecasts		(A) ; (B)	(A) (B)	
	1965-75	11.5 % ; 13 %	8.5 % 9 %	2.4 %
BELGIUM	1953-59	12 %		4.3 %
	1956-60	19 %		6.2 %
	1960-63	20.9 %	12.6 %	7.2 %
CANADA	1954-62	14.5 %		9.5 %
Forecasts				
	1965-70	15 %		11 %
	1970-75	9.1 %		6.1 %
FRANCE	1951-59			4.6 (U)
	1952-59	12.7 %	13 %	
	1959-64	17 %	12.2 %	14.8 %
Forecasts	1964-72			10 %
GERMANY	1950-55	12.7 %	13 %	2.5 %
	1955-60	15.3 %	8.7 %	8.6 %
	1960-64			5.1 %
Forecasts				(A) (B)
	1965-70			-2.1 % 0 %
	1970-75			1.9 % 3.4 %
	1975-80			5,7 % 7.4 %
GREECE	1955-61	3.7 %	7.5 %	8.7 %
Forecasts	1961-74	14.7 %	10.9 %	3.8 %

Table 1 (cont.)

		1 Public expenditure on higher education	2 total public expenditure on education	3 Increase in student numbers
IRELAND	1955-60	7.9 %	3.4 %	4.7 %
	1960-65	19.2 %	6.7 %	
	1960-63			8.3 %
ITALY	1956-62	24 %	14.5 %	5.6 %
	1962-64			8.6 %
Forecasts	1963-74	7.3 %	9.2 %	
NETHERLANDS	1955-60			6.4 %
	1956-61	19.8 %		
	1960-63			10.5 %
	1960-65	20 %	14.4 %	
Forecasts	1966-69	10.1 %		
	1963-75			6.1 %
PORTUGAL	1956-60	12 %	12 %	4.5 %
Forecasts	1960-75	12.2 %	13.7 %	
SWEDEN	1950-62		9 %	
	1959-63	11 %	3.6 %(1)	10.8 %
	1960-62		14 %	
	1960-64			13,3 %
Forecasts	1963-72	7,3 %		8.8 %
	1965-69	11,5 %	5,5 %	6,3 %
SWITZERLAND	1949-57	0.1 %		0 %
	1957-63	3.4 %		8 %
Forecasts		(A) (B)		
	1964-69	17.6 % 18 %		11.2 %

Table 1 (cont.)

		1 Public expenditure on higher education	2 Total public expenditure on education	3 Increase in student numbers
UNITED KINGDOM				
	1957-67	14.2 %		7.2 %
	1959-64	14 %		
	1961-64	13.9 %	9 %	
	1963-65		8,9 %	
	1966-67	12.5 %		
Forecasts	1964-70		4.7 %	
	1967-71	5.8 % (U)		(A) 3 % (B) 2.4 %
UNITED STATES	1951-61	10.5 %	9,4 %	6.3 %
	1957-61	10.3 %	7,1 %	6.2 %
	1960-66			8.2 %
	1961-65	12.5 %		
Forecasts	1965-71	7.3 %		5.7 %
	1971-75	5.7 %		4.2 %
YUGOSLAVIA	1952-56			5.84 %
	1956-61	23.6 %(2)	22.6 %(2)	9.6 %
Forecasts	1962-75	14.8 %	12.7 %	5.9 %

(1) Public expenditure on education, excluding higher education.
(2) Including investment expenditure.
(A) Maximum hypothesis
(B) Minimum hypothesis
(U) Numbers in Universities only.

NB.: Educational expenditure is shown at constant prices, using the cost-of-living index in "International Financial Statistics" (Supplement 1966-1967).

Main sources used:

Austria - E.I.P. Report, O.E.C.D., 1968.
Canada - Financing Higher Education in Canada, Ottawa, 1966.
France - Statistical Information, Ministry of Education, Vth Plan (1966-70).
Germany - Higher Education in the Federal Republic of Germany: Problems and Trends, Bonn, May 1966.
Greece - Mediterranean Regional Project Report, O.E.C.D., 1965.
Ireland - E.I.P. Report, O.E.C.D., 1966.
Italy - Mediterranean Regional Project Report, O.E.C.D., 1965.
Netherlands - E.I.P. Report, O.E.C.D., 1967.
Portugal - Mediterranean Regional Project Report, O.E.C.D., 1966
Sweden - E.I.P. Report, O.E.C.D., 1967
Switzerland - Labbardt Report, Ministry of the Interior, Berne, 1964. Statistical Yearbook, 1966.
United Kingdom - Statistics on Education, Department of Education and Science, 1966 and 1967, Robbins Report.
United States - Office of Education, American Council of Education (1967, 1st and 2nd Issue).
Yugoslavia - Mediterranean Regional Project Report, O.E.C.D., 1965.

---

divergencies between sources of information. It would have been less inaccurate to plot a trend based on all the data available so as to take the intervening years into account; but the general tendency would in any case have remained much the same. The table should therefore be interpreted as a general indication of the trend and the signification of the growth rates should not be regarded as being too precise.

Except where otherwise indicated the basic figures used relate to current public expenditure, for both higher education and total educational expenditure. Capital expenditure has been omitted as the amount varies considerably from one year to another and growth rates might have been distorted. All forms of post-secondary, university and non-university education have been grouped together, for both expenditure and numbers of students; part-time students have been omitted as the figures would distort comparisons.

Expenditure is shown at constant prices based on the general cost-of-living index (1). This procedure can give only a rough idea of the expenditure trends, and it would have been preferable by far to calculate a deflator by taking into account the trend in prices for the main components of educational expenditure. The absence of sufficiently detailed data made this impossible. It may perhaps be assumed that the increases in expenditure shown in the table have been systematically over-estimated, since the cost of living index has risen less rapidly than that of salaries in most of the countries considered. This means that if the price paid for teachers' services has increased (assuming that services followed the general rise in salaries) the volume of "educational services" provided to the community has been proportionally reduced. But here again the margin of error does not seem considerable, and the general trend shown by the figures in Table I may be considered to be reasonably close.

Subject to these reservations, Table 1 brings out a certain number of important points:

1. The increase in expenditure on higher education has been extremely rapid in almost all the countries considered. With the exception of Greece (whose expenditure statistics are unreliable) and Switzerland, annual rates of increase have exceeded 10 per cent over the past 10 years, and this trend

---

(1) "Financial Statistics", Supplement 1965-66, International Monetary Fund, New York, 1967. This cost-of-living index corresponds to the purchasing power of the "average consumer". Attention should however be drawn to a detailed study by Mr. G. Palm (on the purchasing power of educational expenditure in Germany between 1950 and 1962) which shows that the increase in educational expenditure at constant prices (an average of 5.6 per cent per year), measured by means of appropriate deflators, was very much lower than would have been obtained by using the cost-of-living index (10.3 per cent per year) or the overall deflator for G.N.P. (8.9 per cent per year) He arrives at the apparently paradoxical conclusion that the share of educational expenditure in G.N.P. was reduced at constant prices (from 3.04 per cent in 1950 to 2.33 per cent in 1962) whereas it rose at current prices (from 2.43 per cent to 2.89 per cent). The "purchasing power" of public educational expenditure would perhaps be more accurately estimated by taking the number of teachers (or hours of teaching) who are remunerated rather than by calculating teachers' purchasing power. In fact, it is mere convention to measure the "productivity" of teachers (like that of civil servants generally) by means of the remuneration they receive.

Table 2. SHARE OF EXPENDITURE ON HIGHER EDUCATION IN TOTAL EDUCATIONAL EXPENDITURE

	United States		Canada (1)	United Kingdom	France	Germany (5)	Italy (6)	Netherlands	Belgium (7)	Sweden (7)	Japan (8)	Yugoslavia (9)	Greece
	Total expend.	Public expend.		Public expend.	Public expend.	Public expend.	Public expend.		Public expend.	Public expend.	Public expend.	Public expend.	Public expend.
1950	-	-	-	-	-	9 4	4.7	9.5	6.8	4.2	-	-	-
1951	24.8	16.7	-	-	-	8.9	4.6	9.6	6.4	-	-	-	-
1952	-	-	-	-	-	9.5	5.1	10.0	6.3	4.4	-	-	-
1953	24.5	17.1	-	-	-	9.3	5.9	10.0	6.4	-	-	-	-
1954	-	-	-	-	6.8(2)	9.3	5.6	10.7	6.1	4.5	11.3	-	-
1955	24.6	17.0	14.2	-	-	9.3	5.5	10.2	6.4	-	-	-	16.1
1956	26.0	18.7	16.5	-	-	9.6	5.1	9.9	6.4	4.7	-	16.3	-
1957	25.2	18.3	17.0	-	-	10.7	5.1	11.0	6.2	-	-	-	-
1958	27.7	20.1	18.9	-	-	11.3	6.3	12.4	5.8	5.3	-	-	-
1959	27.2	19.4	19.8	10.1	-	11.7	6.2	13.1	6.0	-	-	-	-
1960	28.5	20.2	21.1	10.7	9.2(3)	12.4	8.1	14.3	-	8.0	-	-	-
1961	28.9	20.3	22.0	12.0	-	13.2	7.7	15.8	-	8.6	14.8	17.2	11.7
1962	31.4	22.6	21.6	12.2	-	-	-	-	-	-	-	20.1	-
1963	32.5	24.0	23.7	12.6	14.0(4)	-	10.2	-	-	-	13.2	-	-
1964	33.2	24.8	25.2	14.2	14.5(4)	-	-	-	-	-	-	-	-
1965	33.9	25.6	-	-	-	-	-	-	-	-	-	-	-
1966	-	-	-	-	-	-	-	-	10.5	-	-	-	-
1967	-	-	-	-	-	-	-	-	12.2	-	-	-	-

(1) Expenditure on universities as a percentage of total educational expenditure.
(2) Source: Coût et développement de l'enseignement en France, I.N.S.E.E., 1958.
(3) "The Financing of Education under a Centralised System", by A. Garcia in Financing of Education for Economic Growth , O.E.C.D., 1966.
(4) Estimate based on ordinary educational expenditure and approved programmes mentioned in "Information Statistique", supplement to No. 59 of May 1964.
(5) Edding, op.cit.
(6) Up to 1961, Census No. 21-22, Anno II, for 1963-64, Le Strutture Formative al 1975. Centro Europeo dell'educazione.
(7) Edding, op.cit.
(8) UNESCO, Statistical Yearbook, 1965.
(9) Mediterranean Regional Project Report, O.E.C.D., 1965.

Table 3. NUMBERS IN HIGHER EDUCATION AS A PERCENTAGE OF THE 20-24 AGE-GROUP

	United States		Japan		United Kingdom		Germany		France(2)		Italy		Belgium		Netherlands	
	U	NU	U	NU	U	NU	U	NU	U	NU	U	NU	U	NU	U	NU
1960	27.6	4.0	6.8	0.9	6.0	2.6	4.4	1.8	7.9	1.3	6.6	0.2	5.4	3.8	6.1	4.5
1964	32.7	5.5	8.0 (1)	1.3 (1)	7.7	3.6	5.7	2.6	13.4	2.3	9.1	0.3	8.8 (3)	6.0 (3)	7.3 (1)	4.7

(1) 1963.

(2) Excluding dual enrolments, i.e. students registered both in a university and in a non-university establishment.

(3) 1965.

U = University education or equivalent, leading to a first degree or beyond.

NU = Non-university Higher Education.

appears to have become everywhere more pronounced during the more recent period.

2. These rates are very much higher than the general increase in total educational expenditure, as shown by Table 2, indicating the trend of expenditure on higher education as a percentage share of total educational expenditure for all years for which data are available; it will in fact be seen that this share is constantly increasing.

3. In most cases the increase in expenditure is appreciably higher than that in numbers of students, but the ratio varies considerably from one country to another. As the data used apply only to operating costs, this seems to indicate that expenditure per student has tended to increase in recent years, frequently in considerable proportions. Cases in point are Germany, the Netherlands, Belgium, Italy and Portugal.

4. When rates of increase in expenditure on higher education are compared as between countries, differences cannot be accounted for by respective levels of economic development; rates for Italy, Yugoslavia, Ireland and Portugal are equal to or higher than those of the United States or Sweden. Nor do they tally with economic growth rates - expenditure on higher education has increased no less rapidly in countries with a medium or low rate of growth (United Kingdom, Sweden, Belgium) than in countries with a high growth rate. (Germany, Italy, France). Furthermore, in comparing Table 1 with Table 3 showing respective ratios of students to the total pupolation for 1960 and 1964, it is impossible to conclude that the countries with the lowest rates of enrolment (in higher education) are progressing more quickly in order to catch up, but neither is it possible to confirm the contrary.

5. Student numbers are increasing everywhere in a spectacular manner, the rate being especially marked in the latest years. In most of the countries examined, the yearly growth rates rose from about 5 per cent over the period 1955-1960 to 10 per cent in the following five-year period.

All these comments emphasise the exceptionally fast growth rate of higher education over the past ten years. Such substantial increases, which very rarely occur in any economic activity over so long a period, have exceeded the most optimistic forecasts. In this connection one need only recall that the maximum hypothesis for growth proposed at the Washington Conference (1) in October 1961 was an annual growth rate of 5.5 per cent in number of students (between 1957 and 1970), and one of 7.7 per cent for expenditure on higher education for all the O.E.C.D. countries. According to this maximum hypothesis, total expenditure on education in 1970 would represent 4.8 per cent of G.N.P. (including 4 per cent for the European countries alone). As shown in Table 4 all the countries studied (with the exception of Germany) had already exceeded these figures by 1964. The general conclusion would seem to be that financial or physical limits have been much less rigid than anticipated by the experts a few years ago.

---

(1) *Policy Conference on Economic Growth and Investment in Education*, O.E.C.D., 1962. The rates of growth shown above were calculated on the basis of data in Table 14, page 94.

This educational explosion cannot be attributed to purely economic factors. Neither the requirements for growth of national income, nor the economy's needs for higher executive staff, nor the shortage of scientific and technical personnel provide a satisfactory explanation. The decisive role appears to have been played by such "social" factors as the radical change in the aspirations and attitudes of large social groups with regard to education in general and higher education in particular; the trend may also be due to the gradual expansion of secondary education, furthermore spurred by the educational reforms introduced in many countries. These dynamic phenomena might usefully be studied by the sociologists of education who hitherto have devoted most of their analyses to the unequal access to the educational system of different social groups during some given period.

As concerns financial estimates proper, the main conclusion to be drawn from the overall quantitative analysis of the past 10 years is that this has been a quite exceptional period which cannot last very much longer. Although it is true that the most optimistic forecasts by experts have been greatly exceeded, it would be dangerous to infer that the increase in educational expenditure will be no further curbed than it has been. It is easy enough to illustrate the unrealistic character of estimates obtained by merely extrapolating recent trends. Out of the 15 countries listed in Table 1, nine record an increase in their (public) expenditure on higher education of at least 15 per cent per year, which would mean an increase of 6,300 per cent between 1950 and 1980, a relatively imminent date for which forecasts and plans are already now being prepared.

Even if 1965 instead of 1950 were taken as the reference period, expenditure on higher education by extrapolating the recent trend would be multiplied 8 times between now and 1980, whereas national product would be no more than doubled (1).

---

(1) In the favourable hypothesis of an annual economic growth rate of 5 per cent.

Table 4. EXPENDITURE ON EDUCATION IN RELATION TO G.N.P.

	United States	(1) Japan	(1) United Kingdom	(1) Germany	France	(1) Italy	(1) Belgium	(1) Netherlands
1959	5.00	4.07	3.62	2.89	3.41	3.59	4.28	4.79
1964	6.18	5.28 (2)	4.49	3.23	4.28	4.86	4.30	5.66

(1) Public expenditure only

(2) 1963

Total (public) educational expenditure in nine countries (according to the data given in Table 1) shows a rate of increase of at least 10 per cent, which would mean an increase of 300 per cent between now and 1980 (and of 1,650 per cent as from 1950). The share of G.N.P. devoted to public expenditure on education would have doubled in relation to the percentages shown in Table 4, which already seem very high.

In the particular case of the Netherlands, for which statistical series from 1950 are available, extrapolation of the trends observed over the past 15 years would result in the following projections for 1980: educational expenditure would have increased to 11.4 per cent of G.N.P. (5.5 per cent in 1955), and 38 per cent of these resources would be earmarked for higher education, compared to one-tenth in 1950 and 15.8 per cent in 1961 (1).

These examples, which are based on the familiar laws of geometric progression show clearly that the experience of the past fifteen years is of little help in drawing up forecasts for the next 15 years. Table 1 moreover shows that all countries having planned for the medium or long term, acknowledge implicitly that the increase in student numbers and to a less extent in expenditure on higher education will be appreciably smaller than during the recent period. But since none of these plans specified any measures to modify the present trend, the different factors that must be analysed in depth in order to outline probable future developments will simply be mentioned.

---

(1) By extrapolating the percentage increases observed between 1950 and 1965 for the ratio E/G.N.P., a ratio of $\frac{5.5}{2.64} = 2.08$ is obtained, hence, for a period of equal length (1965-80): $5.5 \times 2.08 = 11.4$ per cent. For the ratio E/H.Ed., we extrapolated from the period 1950-61, as no earlier comparable data for higher education were available:

$$\frac{15.8}{9.5} = 1.66 ; \quad \sqrt[11]{1.66} = 1.0472; \quad 1.0472^{19} = 2.4 ;$$
$$15.8 \times 2.4 = 38\% .$$

III. FACTORS INFLUENCING TRENDS IN COSTS AND EXPENDITURE

This question goes far beyond forecasting techniques alone. It is easy to replace the exponential curves so far used (and normally showing annual growth rates) by S curves of "logistic" functions, which allow for a slackening off in expansion after a period of rapid growth, this reversal of the trend gradually resulting in stability which can be expressed as a specific proportion of national income or of total educational expenditure. But the difficulty lies in determining exactly when and at what level the point of inflection should be plotted.

Little can be learnt from the experience of the more developed countries in this respect. There is, of course, a fairly close relationship between G.N.P. and educational expenditure for all countries and for the same year, as shown by spatial regression analysis (1). The analysis of these results shows that the equations thus obtained have no predictive value, probably because an historical factor is involved which is not apparent in any instantaneous international comparison, that is, the worldwide recognition of the importance of education thus leading to a general increase in educational expenditure. This can moreover be seen from direct observation of the more advanced industrialised countries, which are continuing to increase the share of their resources devoted to education just as fast as those with leeway to make up. Possibly the slower increase in educational expenditure that can be seen in the most recent budgets of certain European countries (France, Great Britain, etc.) is a sign of a reversal in the trend, but it is too soon to draw any definite conclusion to this effect. But in the long-term one can be sure that education cannot long continue to expand at a more rapid rate than all other budgetary expenditure, i.e. to the detriment of the other social, economic or administrative functions of the State. Although it is not possible to determine either the probable date when the limits will be reached, or the maximum percentage that will be acceptable, an attempt can at least be made to find out how the rate of expansion will slow down. As a statistical analysis of past events does not give satisfactory results, a less systematic method will be used here by listing a few of the main factors likely to affect the trend in numbers and the costs of higher education.

---

(1) "Educational expenditure in developing areas", by Daniel Blot and Michel Debeauvais, in Financing of Education for Economic Growth, O.E.C.D., 1966.

1. Factors affecting the trend in numbers

a) Demographic factors

The increase in the 20-24 year age groups receiving higher education will be greatest in the United States and Canada, where it will exceed an annual rate of 3 per cent. In the Western European countries, where it will be in the neighbourhood of 1 per cent, the main influence will be that of the post-war "baby boom" since the mere maintenance of the previous enrolment rates will call for a very rapid increase in the enrolment capacity of educational establishments. This pressure can already be seen very clearly in France, where in 1946, the annual birth rate went from 600,000 to 800,000. The post-war generation is now seeking entry to the universities; this creates very difficult problems of adjustment, despite the forecasts made in successive plans. A similar problem will no doubt arise in such countries as Norway, the Netherlands, Denmark, Sweden or the United Kingdom, where the population trend has been much the same. French experience in fact tends to show that enrolment rates in secondary and higher education are hardly affected by demographic variations, which consequently have an immediate impact on the numbers enrolled and necessitate a particularly prompt effort of adjustment.

b) Rates of enrolment

Table 3 shows that the increase in rates of enrolment in higher education has a much greater influence on the trend in numbers than the demographic increases mentioned in the previous paragraph; nor does it seem that this trend has yet reached its peak: the United States has reached the rate of 40 per cent, and in certain States, California and New York for example, over half of the total number of young people already receive higher education. Furthermore, the effort by all European countries to democratise higher education should lead to a strengthening of the present trend, since it is hardly likely that the admission of a greater number of students from less privileged social groups (industrial and farm workers for example) will adversely affect the numbers of other groups which are at present represented.

c) Current or projected reforms in secondary education (1)

The purpose of these reforms is gradually to make lower secondary education the first cycle accessible to all, but they have the effect of increasing opportunities for access to upper secondary education (the second cycle) and accordingly the latter's rate of expansion. Another feature of these reforms is to grant equivalence for all long secondary courses with classics courses, particularly for purposes of admission to higher education. Moreover, experience tends to show that in the countries which hold a secondary terminal examination giving access to higher education (Baccalauréat, Abitur, etc.), this examination does not act as a regulator, as the percentage of passes remains roughly the same over a period of time, whatever the number of candidates. The percentage of students with secondary-school diplomas entering higher education approaches the maximum everywhere. It may therefore be assumed that any quantitative or qualitative improvements in secondary education will have direct repercussions on the number of new students. Even the United Kingdom which, exceptionally, maintains strict admission standards depending on the discretionary power of each University, since the report by the Robbins Commission has adopted a policy of expansion based on the principle that every candidate with the necessary qualifications should be admitted either to the University or at least to an establishment of higher education.

---

(1) See Development of Secondary Education, O.E.C.D., 1969.

d) The different reforms of higher education which are being planned in an increasing number of European countries are aimed directly or indirectly at reducing the number of drop-outs. Several recent surveys have shown that an extremely high proportion of students beginning courses of higher education (more than half in some countries) drop before obtaining a degree. These drop-outs may be regarded as a spontaneous regulating of the total number of students in relation to the capacity of the educational system in countries where there is no restriction on admission and are attributed in part to the excessive length of higher education courses. Where shorter courses of two to three years are introduced it is probable that, paradoxically, they will have the effect of reducing the present drop-out among first year students. Similarly, any qualitative improvements in programmes and teaching methods should raise the continuance and completion rates.

These quantitative consequences of qualitative and structural reforms do not so far seem to have been taken into consideration, but they might well reinforce the effects of the other factors mentioned earlier.

2. Factors influencing the trend of unit costs

Unit operational or equipment costs have been calculated in most European countries over the past few years. They have served mainly to provide figures for the cost of the expected expansion in student numbers. But the general assumption has been that these costs would remain constant over the forecasting period, an assumption which is open to criticism.

Professor Edding has insisted several times that increases in teachers' salaries should be taken into account, even if the extent of such a trend might be difficult to determine. At the same time an O.E.C.D. study made by Mr. Van Dijk in 1966 showed that unit costs had risen considerably in the Netherlands over the past fifteen years, and that more than one-fifth of this increase was due to factors other than increases in teachers' salaries or the price of school equipment. The importance of factors influencing unit costs is therefore evident. Only a few of them can be dealt with here.

a) Teachers' salaries

Have teachers' salaries increased or declined over the past few years considered in terms of purchasing power or in relation to the general wage structure? Few studies have been made of this controversial question. But as far as categories of higher education are concerned, two positive factors may be noted: the growing number of students will result in a higher demand than ever for teachers at a time when the need for such top-level graduates will be felt in other sectors of the economy as a consequence of technological progress. Occupational mobility between teaching and other sectors of activity will also be facilitated by the rapid development of non-university research, and by the emergence of new openings in special fields whose applications were previously almost entirely limited to the academic world. Mathematics is an example in point, with the use of computers and graduates in the exact sciences; but the trend is gradually becoming apparent in **such new** social **science disciplines** as psychology, economics, sociology, etc. As a result, there will tend to be increasing competition on the labour market for highly qualified personnel.

From a more general standpoint the overall increase in salaries will lead to considerably increased unit costs. In most European countries, the general wage index has risen more rapidly than the cost-of-living index, and even more rapidly than the national product over the past ten years. It would be prudent to make allowance in planning (as was done in the Report by the Washington Conference to which reference was made earlier) for an increase in teachers' salaries equivalent to that of income per head, which would mean an increase of 50 per cent over 10 years, at an economic growth rate comparable to that of the last 10 year period (4.1 per cent per year). Since teachers' salaries are the major item of expenditure on higher education, all such factors of increase mentioned above will have a considerable influence on the trend of unit costs.

b) Investment expenditure accounts for an increasing proportion of total expenditure on higher education, a trend which will no doubt become more pronounced in forthcoming years. Not only is the investment necessary for increasingly costly scientific and technical equipment, but the social sciences are gradually moving into the scientific (or pre-scientific) era of experimentation with the use of computers; furthermore, the collection of data needed to analyse social developments will call for increasing recourse to scientific surveys, as the study of existing information will no longer be sufficient. Several "literary" disciplines, such as linguistics, archaeology, history, are also beginning to make use of automatic computing methods; others will probably follow suit. This development will lead not only to higher investment costs for each new place, but will also tend to increase unit operating costs. A first reason is the cost of maintaining this new equipment; and another the situation in countries whose universities are still under-equipped (Mediterranean countries, France, etc.), here unit costs are consequently much lower than elsewhere and programmes for the expansion of higher education will call for far higher standards in education than at present, with regard to the teacher/student ratio, the number of square metres per student, libraries, laboratories or social services. All these factors will help to increase "marginal costs", i.e. the cost per extra student.

c) The increase in research expenditure will undoubtedly become even more rapid, as it has recently been recognised that a systematic policy for scientific development must be a component of general development policy. At present the main emphasis is on development research directly related to industry, but one of the principal objectives may be assumed to be a balanced development of the different research activities, thus underlining the essential role of fundamental research not only in pure science but in the social sciences which are still very neglected in most European universities where the classical humanities still come first. This factor will reinforce those mentioned earlier.

d) The distribution of students among the different branches of higher education will change in the next ten years in favour of the scientific and technical disciplines, as all the O.E.C.D. countries are planning measures to this end. This more than proportional increase in the number of students and new buildings in these branches will of course cause average unit costs to increase, since costs per student are five to ten times higher than in the "literary" branches.

e) In Europe reforms in programmes and teaching methods have hardly progressed beyond the planning or early experimental stage. But there is increasing recognition of the need for a systematic development of innovations, including such "new methods" as teaching by radio or television and programmed education. It is no longer claimed as categorically as a few years ago that these changes in the "technology" of education will take the educational system from the craft stage into the industrial era and solve financing problems by lowering unit costs and present teacher/student ratios. The present-day view is rather that the main advantage of the "teaching aids" will be to improve the effectiveness of teaching, but that the direct relationship between teacher and student will remain essential. In any case it is considered that these methods, which moreover are to be introduced gradually, will tend to have the effect of increasing expenditure per student, at least during the initial period.

Two contradictory trends therefore clearly emerge - first, there is no indication that numbers or expenditure will expand more slowly; instead, several new factors will help to speed up growth. Secondly, other requirements of the economy and the community will manifestly set limits to this expansion in the coming years. What form will such inevitable tensions take, and where will it be possible to strike a proper balance? The question is all the more difficult to answer as the problem has not yet been clearly stated, whether in the educational system which has so rapidly become inured to faster growth that the emphasis is on emergency measures to cope with the large inflow of students, or whether in other sectors of activity, which have generally regarded expansion as a way of meeting their needs for qualified personnel, rarely recognising that it might compete with their own requirements. The public in general has been chiefly interested in greater ease of access to the highest levels of education, and increased public educational expenditure has been looked upon with favour.

This happy situation is unlikely to last. Students and teachers are increasingly dissatisfied with working conditions in higher education, which is adjusting too slowly to such a considerable quantitative change; both employers and graduates feel that the type of training provided by higher education is becoming less and less related to the needs of the economy; the additional problem of openings may well arise in a few years' time if the labour market is unable to adjust quickly enough to be able to offer increasing numbers of graduates work corresponding to their aspirations.

If such changes in attitude do in fact come about, this will change the nature of the problem and open the way for solutions which today seem remote. It will no doubt be acknowledged that education uses up resources which are scarce (highly qualified personnel as well as budgetary appropriations) and that they must be allocated in the light of overall requirements with regard to manpower, public and private consumption and investment for the community as a whole. The problems of the expansion of higher education and its limits will then be stated in terms which are more familiar to the economist and the planner than is the case today. Plans for education, which hitherto have been programmes for expansion drawn up under the pressure of spontaneous demand by users, will become more an instrument for choice and the determination of priorities. In this context questions of financing will no longer be confined to estimates of expenditure for achieving the quantitative growth of the educational system, but will take into account standards of efficiency enabling the results obtained to be judged against clearly defined objectives. This is not a Utopian point of view; it simply means the use of planning methods similar to those normally applied when a choice must be made between different public investments, or more generally between different possible uses of the national income. But this will require such a radical change in present attitudes to education that the change will probably be a difficult one for teachers even more than for the other sectors of opinion, and just what repercussions this will have on the internal operation and structure of the educational system, cannot yet clearly be foreseen.

Meanwhile, preparation for these changes will most likely impose an additional financial burden, since the educational system cannot suddenly cease working to allow any final, sweeping reform to take place from one day to the next. A continuous policy of innovation in teaching will be necessary, but its introduction will immediately call for additional expenditure for research and experimentation. Teaching reforms which aim at more efficient curricula and methods in higher education will mean additional costs, even if they contribute to a reduction in costs over the long term. Similarly, the introduction of an effective system of continuous higher education in European countries will make it easier to accept limitations in length of study or numbers of students as determined by manpower requirements and budgetary considerations, but the initial expenditure to make continuous education a reality will be considerable.

Can new sources of finance be found enabling this transitional period to be negotiated without any serious crisis? As far as public financing is concerned many European countries presumably can still afford to increase budgetary appropriations in order to maintain the high rate of recent expansion for a few more years. Another point which might be considered is the possible advantage of greater decentralisation in countries where the contribution from the central budget seems excessive. But recent trends in countries where local authorities traditionally have a large measure of independence in educational matters is hardly encouraging in this respect (1). Nor does higher education offer much scope for greater local responsibility. Is there, moreover, any prospect of a greater financial contribution from the private sector? In the European countries, which are accustomed to the idea of free education, it seems difficult to count on introducing school fees, even based on family income levels, though a contribution by such beneficiaries might be justified by social as well as economic arguments. It must also be noted that in other countries school fees constitute a diminishing fraction of total expenditure, or are paid almost entirely by the public authorities, as in Great Britain.

---

(1) See Financing of Education for Economic Growth, O.E.C.D., 1966.

Industry might possibly be a more likely source of funds, in that contracts for applied research may constitute part of the resources of the laboratories of scientific and technical establishments. The demands of technological progress moreover will presumably lead to a redistribution of training responsibilities between the University and industry, thus strengthening the role of "users" in vocational training; this could further the present tendency on the part of firms (and Government departments) to increase their training efforts and promote their financial participation. Another possible contribution might be for industry to offer the services of qualified personnel as part-time teachers in higher education establishments.

Yet these additional financial contributions can be but small in relation to needs. The main effort must therefore be directed towards innovations and structural reforms which will gradually make higher education more effective.

A few studies might be suggested which would help education policy makers to meet the new situation which will arise:

1. Studies in depth on expenditure and costs incurred for higher education in countries where such studies have not yet been undertaken, i.e. in most European countries. These studies should not be confined to the examination of public accounts (national or local budgets); they should analyse, on the basis of economic criteria, actual expenditure and costs for both the community and individuals. Other studies could deal with transfers of income in the form of subsidies and allowances, and free education. At the same time, comparable time series of expenditure and costs should be established, and expressed in constant prices by using appropriate indices for each country.

   These national data and calculations of average unit costs should be supplemented by cost-price studies at individual establishment level, so that the often considerable disparities from one establishment to another can be ascertained. These comparisons would undoubtedly help to show how certain excessive costs could best be reduced or financial resources more effectively used. The notion of productivity might also perhaps be introduced into the educational system, and thus to some extent provide the same kind of stimulus as the competition for products and services subject to market laws.

2. There is a need for international studies of expenditure and costs, prepared on a more solid comparative basis than at present. Whether for reasons of emulation or rivalry such comparisons play an increasingly important role in the preparation of budgetary decisions. International organisations at present seem best equipped to undertake such studies, which require permanent contacts with national statistical services, but they must be able to undertake studies which go beyond the mere collection and publication of existing national data, which are extremely difficult to compare.

In summing up, the problems of financing higher education may be said to have widely different aspects according to the time-span concerned. In the short term, the prime necessity is to use rapidly growing budgetary appropriations at a suitable rate, whether to institute emergency measures or to implement programmes for the creation and extension of establishments. In the medium term the need is for a coherent expansion programme allowing for increasing numbers and adaptation to new economic and social conditions, while estimating the cost of such measures and striking an acceptable compromise between the possible and the desirable. In the long term the inevitable limits of expansion must be determined from the financing, teacher supply and labour-market standpoints. In the light of these constraints the output of graduates must be compared with the needs of the economy, and the various roles and structures of higher education must be redefined. These last three aspects have scarcely been touched upon in the present plans of the European countries, but are likely to become the most important ones in the fairly near future and the relevant decisions must be taken now. Long-term planning would serve little purpose if it merely extrapolated the medium-term forecasts over a few additional years. Educational planners are compelled primarily to have proper regard for the weight of existing structures and historical trends. One of the advantages of long-term forecasting is that it focuses on new problems as determined by future needs, which are sometimes hidden by extrapolations of the past and the pressure of present events.

POLICY PROBLEMS ARISING FROM AID TO STUDENTS

Examples which have been encountered in France and some Member countries of O.E.C.D.

by

P. LADERRIERE

INTRODUCTION

Only policy problems will be dealt with in this paper; a study in depth of this subject based on quantitative factors does not seem possible at the present time. Statistical information on aid to students is rare or confused. As the necessary statistics are unavailable, a complete picture of the action so far undertaken in this respect is not possible, such as, for example, comparisons of: the social background of the students, the types of study chosen, types of aid received and their success (or failure) in higher education. The few statistics available in general concern University higher education; non-University higher education sometimes follows different rules of which even less is known than of those for the universities. All surveys so far attempted have been incomplete because a number of fundamental points have not been cleared up. For example, is it really possible to compare the percentage of students benefiting from direct aid (1) if no information is available on the various tuition fees a student must pay for higher education? Direct aid to students can be used to finance indirectly a part of the operational costs of the universities. Some universities, jealous of their autonomy, as in the United States, have always been in favour of this solution since the alternative might have led in the long run to increased Government support which might signify a certain degree of control (2).

---

(1) In Annex II some percentages are given, with the sole purpose of demonstrating the impossibility of comparing information based on definitions which are different, incomplete .... or unknown.

(2) In the United States in 1957-58 tuition fees represented 46 per cent of the income of private higher education institutes, against 8 per cent for public institutes (25 per cent for these establishments as a whole: about the same percentage as in 1920). Figures are taken from the article by D. Vogelnik "A comparison between the financing of higher education in the United States and Yugoslavia", published in Economic Aspects of Higher Education, O.E.C.D. Paris, 1964.

Is it possible, without going deeply into this question, to compare aid to American students with that offered to English or French students when in Great Britain tuition fees which in 1920 were 34 per cent of university incomes went down in 1955-1956 to 13 per cent (1) and where nearly 80 per cent of the students receive direct aid, and when in France tuition fees are extremely low (in 1955 they covered only 5.7 per cent of the costs) (2) which raises immediately the problem of a transfer of revenue for the benefit of the better off students?

Before attempting any international comparisons, a detailed survey should be made into the student's budget bringing out each of its components (3). Apart from the purely quantitative information necessary to show who is receiving aid or to situate aid expenditure in the context of overall educational expenditure (4), a description of the methods for attributing aid must be given if international comparisons are to be made. This description naturally should take into account the two principal types of aid offered to students. Direct aid, that is the free disposal of a sum of money allocated directly (scholarships, loans, pre-wages) or indirectly (tax relief, increased family allowances) to the student (or to his family). Indirect aid, that is, the making available to the student of a certain number of services, in addition to that of education in the strict sense, either free or at less than cost (restaurants, student residences, university medical services, etc.); aid to students may apply to all students, or may be selective.

---

(1) "General problems in education and manpower". S.E. Harris in Economic Aspects of Higher Education, O.E.C.D., Paris, 1964.

(2) "Coût et développement de l'Enseignement en France" (Cost and development of education in France). I.N.S.E.E., 1958, (in French only).

(3) A remarkable example of a survey by opinion poll methods on the student's budget (for the country as a whole) was published by the review "Recherches Universitaires" (1964, No. 6) entitled "Le budget de l'étudiant" (The student's budget), (in French only).

(4) See the two tables given as examples in the appendix "Direct and indirect aid to students" to Chapter VI: "The costs of education - methods of analysis and projection" in the publication Methods and Statistical Needs for Educational Planning O.E.C.D., Paris 1967; the comparison of information on the financing of studies may give rise also to comparisons of the cost per graduate taking into account the aid received by the graduate.

Indirect aid leads to two types of expenditure: current expenditure (management) and capital expenditure (1). As the increase in these different expenditures has been very heavy in recent years due to the rise in the number of students in higher education, and as a quantitative study is impossible at the present moment, an attempt has been made to give some of the policy problems arising as a result of aid to students. The examples will be based principally on experience in France, Belgium, Sweden and Italy. Recent arguments made concerning aid to students will be examined in the first section and in the second, special reference will be made to the relationship between aid and the democratisation of access to higher education; the third section will give an example of the convergence of the principles on which aid is granted to students, with any variations in the type of aid for the different study cycles; finally in the fourth section, the problem of the neutrality of aid will be dealt with. In conclusion stress will be laid on the need to harmonise the different types of aid.

I. ARGUMENTS RECENTLY DEVELOPED IN RELATION TO STUDENT AID

In some countries, since direct aid to students can be used to cover the real costs of running certain services provided by indirect aid, an effort will be made here to discover good reasons for setting up direct aid to students. If, in general, aid to students does not depend on one single criterion, in many countries its form can be explained by the presence of one overriding criterion. So that the strategy adopted by some national authorities when fixing the type of aid they grant to students is understood better, the different criteria must be presented separately.

A) Arguments in favour of general student aid

From a strictly economic point of view, as a higher education diploma, in general, leads to a high salary, the conclusion could be drawn that the student made an investment which would show a profit in the near future. One supposition is that this investment might be financed by the student himself, or by his family. But this first supposition appears less and less probable for, as higher education expands an increasing number of students from less privileged social classes are admitted. Formerly, in developed countries, only a few students from poor families received private or public aid based in fact on charitable considerations; the majority of students in view of their social origins and the role assigned to the family in paying for education, received no aid from the community: a situation of this kind still exists to-day in certain developing countries.

---

(1) See the publication quoted in footnote (4) on the preceding page.

The more democratic concept of access to higher education which has developed has made it necessary to re-examine the problems raised by the amount and the recipients of aid. There has been a progressive transfer of the financial responsibility for education from the individual to the community represented principally by the State or local communities. But soon the question was to arise whether, as a consequence of this growth in potential aid, recipients, public or para-public bodies would not be responsible for the whole cost of a student's education.

For some years, in fact, it has been proposed in certain circles that public bodies finance the education of all students without exception. Three types of arguments have been put forward in support of this thesis. The first considers the psychological consequences of a student's having to depend on his family: courses tend to get longer, some students marry while still at the university; a student of 24 does not feel the same about depending on the family as when he was 15. Moreover, aid from the family plus various other types of aid (scholarships, for example) are not sufficient to pay for long courses, so that the student is obliged to work thus creating a different sort of dependence, which, indirectly, may be reflected in the quality of his work. The second argument, which is economic, is summed up in a French report (1) as follows "... higher education is not only a 'private investment' but also a 'State investment'...". There will be 'external profits' for the community when persons decide to go on to higher education. For its part, the Community should be responsible for financing this education - the third argument put forward - for, as fairly high, automatic aid is based only on intellectual criteria, it cannot but help democratise access to higher education. Certain proposals have therefore been put forward along the lines of what is called a "pre-wage" attributed to all students on the basis of academic criteria (2).

---

(1) "Les conditions de développement, de recrutement, de fonctionnement et de localisation des Grandes Ecoles" - Recueil et monographies No. 47 - La Documentation Française.

(2) The arguments in favour of this thesis have been developed in France in the two following brochures: "l'Allocation d'Etudes", Union des Grandes Ecoles - Union Nationale des Etudiants de France and "l'Allocation d'Etudes", by J. Chollet in 21/27, No. 9, November 1964.

B) Reserves concerning general student aid

This proposal has never been accepted because, at a time when other Ministry of Education expenditure and that of other socio-economic ministries (Health, Labour, for example) are growing, it would cause a considerable increase in one section of the national education budget without any certitude that the arguments put forward to justify this proposal are valid.

In fact, to return to the economic argument, all branches of education do not necessarily lead to "external profits" for the community, unless access to higher education is tied automatically, by means of the rigid planning of "pre-wages", to highly qualified manpower requirements, with all the risks this planning technique may entail (1). In fact, the theoretical research so far carried out has not yet been able to give a clear answer concerning the real contribution of education to economic growth (2).

However, the benefits resulting from higher education do not go only to society but are shared by the individual; is it normal that he should be able to benefit from a higher salary in the future because of an investment which will cost him nothing? Sometimes it may cost him nothing in the most limited sense of the term because his parents, being in comfortable circumstances (or even not very comfortable) will finance this investment. Neither is the argument "democratisation of higher education" any truer. At the present time, in many countries, the social background according to the social-professional category of the students' parents is roughly the opposite of the distribution of these categories in the active population. The only result of financing a "pre-wage" by means of taxation would therefore be to transfer the income of the less favoured classes of the population to the more favoured. Thus, any immediate action to democratise education seems to be needed more at the level of secondary than higher education.

---

(1) See on this subject: Manpower Forecasting in Educational Planning, Human Resources Development (Document Series), O.E.C.D., Paris, 1967.

(2) See in particular two publications of the Study Group in the Economics of Education: The Residual Factor and Economic Growth (1965) and Economic Aspects of Higher Education (1964) in particular the article by W.G. Bowen: "Assessing the Economic Contribution of Education: An Appraisal of Alternative Approaches".

C) The Psychological aspect and the Swedish loan policy

It appears therefore that the interest aroused by this debate on what is being far less frequently referred to as a "pre-wage" (the student in fact is only being trained, and can with difficulty be classed among the "intellectual workers" receiving a remuneration before entering the working population - if he does enter) but rather as a "study grant", should be concentrated on ways of making the student more "psychologically" independent of his family or of any other form of partial aid (insufficient aid in the form of a scholarship; **need to have half-** or full-time employment, etc.). It is increasingly being recognised that after 18-20 years of age the student must be considered as a grown up person, and that the fact of his being a student must not lead to a material or psychological situation very different from that of those individuals of his age already working. Bearing in mind that "... higher education is a national duty for all those capable of it, and the carrying out of this duty implies a counterpart..." (1), and that the student should be able to feel he is independent after a certain age, what solutions are possible?

Sweden has proposed a plan, in force since July 1964, which attempts to reconcile the different points of view discussed above. Higher education being considered, from an economic point of view, as a long-term investment, a more rational method of financing would be by loans to the student, the subsequent repayment being facilitated by the higher earnings received by the holder of a diploma. But this repayment cannot be complete; the "external profits" acquired by the community ought to have some counterpart for the individual. Part of the aid provided therefore takes the form of a gift and is borne by the **community**(2) All students, without exception and whatever the income of their parents, can apply for these loans; all students are thus given the same degree of "independence" and access to higher education is made more democratic by offering a loan calculated on the basis of a typical budget which changes with the cost of living

---

(1) "Les conditions de développement, de recrutement et de fonctionnement et de localisation des Grandes Ecoles" - Recueil et Monographies No. 47 - La Documentation Française.

(2) This part is about 23.5 per cent but the real aid of the community is higher than this percentage if the interest bonus granted by the State at the time of repayment is taken into account; details of the Swedish legislation are to be found in the report: Educational Policy and Planning - Sweden, O.E.C.D., Paris 1967.

D) Reserves with regard to loan policy

It is still too soon to judge the results of this new policy instituted in 1964. Certain criticisms have been made concerning the cost of this aid. The principle of this combination of loans and gifts appears attractive, but the fact that it is non-selective leads to heavy expenditure, perhaps to the detriment of other forms of educational expansion. Nevertheless, a similar formula has been proposed in France for a limited number of students - those attending the "Grandes Ecoles". Considering that the severity of recruitment constitutes a guarantee and that in France, those pupils of the "Grandes Ecoles" who were to become civil servants receive a "pre-wage", a commission (1) has proposed that an ex officio grant be made to cover part of a minimum budget established in advance and which could not be less than 50 per cent, the remainder being provided as a loan without interest to all those who request it. This proposition has not yet been accepted.

Wide use is also made of the loan system in Norway and Denmark, although in many other countries, it is thought to create psychological obstacles to a more democratic access to higher education. It is feared that students coming from the more modest social-professional categories will not apply for them because of the prospect of repayment. Thus, in France (2) as in Belgium (3) loans do not affect one per cent of the students. In France, in particular, the Commission of the Vth Plan could not reach agreement on a formula of repayable loans which appeared less advantageous than that offered by the Swedish authorities or on that proposed by the Reform Commission of the "Grandes Ecoles"; in fact, partial support by the community for the financing of education does not seem to be offered (apart, perhaps, from an interest bonus) (4). A new experiment, taking into account possible reserves, and which is also in its early stages, deserves to be closely followed. Italy has recently instituted a "study grant", which will be examined in more detail later, and based on both social and intellectual criteria. This aid, which is trying to be effective, looks like another useful attempt to reconcile objectives which, if all were to be satisfied immediately, might well, because of the cost, upset the development of a balanced educational system. The following chapters are an attempt to examine in detail the practical results of adopting certain criteria for student aid.

---

(1) "Les conditions de développement, de recrutement, de fonctionnement et de localisation des Grandes Ecoles en France" - Recueil et Monographies No. 47 - La Documentation Française.

(2) See Annex III.

(3) Information taken from Table 43 of the study by P. Laderrière: "Essai d'analyse du financement de l'enseignement universitaire en Belgique" D.A.S./O.E.C.D. Document Series.

(4) Neither could this Commission reach agreement concerning a proposal for a general grant for education. See: Rapport général de la Commission de l'équipement scolaire, universitaire et sportif, Ve Plan 1966-1970: Ve Partie: "l'orientation et l'action sociale".

II. STUDENT AID AND THE DEMOCRATISATION OF ACCESS TO HIGHER EDUCATION

Before the Second World War, the aid given to students was small and relatively concentrated on a few individuals, the objective being to allow a few brilliant pupils from the most modest social classes to continue their education. Since then, the principles generally written into national constitutions aim at assisting all those who are able to benefit from the highest levels of education. Up to a fairly recent date, and without going very deeply into the matter, it was clear that democratisation was not taking place despite the growth in material aid offered to certain categories of students. Students attending university higher education in many of the O.E.C.D. Member countries generally come from a socio-professional background which represents a small part of the working population. It seems, in particular, that the middle classes have seized, to their profit, the machinery which should in fact have benefited the social classes the least represented in higher education. This tendency is less obvious in non-university higher education and vocational training, which is sometimes shorter and may not require the same secondary diplomas as university admission. These signs of partial failure in student aid policy however, make it possible to restate this problem in its true context: that of the structure itself of the educational system as a whole, particularly at secondary level. The Swedish authorities have noticed, for example, that the pupil's social background was not a determining factor in the continuation of his studies, once the gymnasium diploma had been obtained (1). It was shown that any differences which continued to exist were due, as for example the geographical characteristics affecting pupils (1), to variations observed when pupils transferred from the first to the second cycle of secondary education. Thus, one of the means of democratising access to higher education is found in secondary education, and this raises the problem of the strategy for allotting aid which can be offered to different levels of education. Before examining this point, attention is drawn to the importance of such measures as the abolition of differences in the social prestige attached to different types of higher education.

---

(1) See Educational Policy and Planning - Sweden, O.E.C.D. Paris, 1967.

A) Aid and the social prestige of higher education establishments

When children of the more modest social classes reach the threshold of higher education, they generally prefer the non-university type. It may happen, however, that the differences of what can be qualified as "social prestige" may mean for the students in these establishments a smaller amount of aid than that offered to university students. Not only is direct aid often less, but indirect aid as well, for the non-university higher education establishments are sometimes smaller than a faculty or a university, and this tends to increase the cost of services offered in the form of indirect aid (student residences or restaurants). A clear example of differentiated aid may be found in Belgium (2). Scholarship students represented 47.12 per cent of the total students in non-university higher education, in 1964-65. The average scholarship amounted to B.Fr.12,108 for the special engineer and technician schools and the commercial colleges and B.Fr.10,381 for students in all other types of establishments. Against this, 32.55 per cent of university students were scholarship holders, the average scholarship being B.Fr.20,000. Non-university higher education scholarships may vary from B.Fr.5,000 to B.Fr.40,000 and university higher education scholarships from B.Fr.5,000 to B.Fr. 49,000. The immediate conclusions one might be tempted to draw from the Belgian example should be qualified, for the short distances between the educational establishment and the student's home, possibly favoured by the greater decentralisation of non-university higher education establishments, may justify a difference in these amounts. But do they justify a variation of from one to two between the average rate for scholarships?

---

(1) See on this subject in respect of France: "Regional inequalities of opportunity in French education and the measures designed to reduce them" by P. Laderrière - in Social Objectives in Educational Planning, Study Group in the Economics of Education, O.E.C.D., Paris, 1967.

(2) See Etudes et Documents, No. 31; 1966. Brussels, Ministry of National Education and Culture: Rapport d'activité du Fonds National des Etudes (for 1964-65).

There is apparantly a problem concerning the value of the scholarships in non-university education, for the "Fonds National des Etudes" report states that "only a large increase in appropriations would allow the average amount per scholarship to be raised substantially in future". Since the formula traditionally used when granting scholarships is: "Scholarships will be granted within the limit of budgetary appropriations...", one is faced with a deliberate choice, the criteria being unknown. Does one want to see more students in University education than in non-university education? If the social background of students is more modest in the latter, is there not a risk of penalising the social classes who send their children there?

The Swedish authorities have put an end to this situation since 1964 by granting the same amount of aid to students seeking admission to any sort of higher establishment, so as to reduce the differences in social prestige attached to different types of higher establishment. French legislation is similar; in addition, this strictly "social" objective may have a fortunate effect on the distribution of students among the different types of higher education: some students will have less hesitation in enrolling in "non-university" higher education. However, the Belgian statement quoted above concerning the need to increase the amount of aid to students in non-university establishments, or the different reports urging that the amount be increased, even for recipients of aid in university higher education, raises the question of the relation between the overall allocation available for aid purposes and the number of candidates for this aid.

B) Dispersed or concentrated aid?

In France, between 1952 and 1964 the growth in the numbers in higher education led to an increase of about 250 per cent in aid to students (scholarships, student residences and restaurants) (1). Another example of the importance of student aid is provided by the Belgian higher education service which according to forecasts which are already old, was to invest around 23 per cent of its credits in available capital in indirect aid to students between 1955 and 1970 (2). Examples of the increase in student aid are increasing rapidly. Unfortunately, in view of the lack of statistical information, it is impossible at the present time to give an accurate indication of the percentage of current expenditures and of capital devoted to this purpose.

---

(1) Informations statistiques - Supplement to No. 59, May 1964, 1st Part: "L'évolution du budget de l'éducation nationale depuis 1952".

(2) See Table 50 of the study by P. Laderrière: "Essai d'analyse du financement de l'enseignement universitaire en Belgique", D.A.S./O.E.C.D., Document Series.

The gradual taking over of these expenditures by the community, as represented by the State, the local authorities or the education establishments themselves, has coincided with the growth of other types of expenditure. Even for the national education budget, in view of the resources available, there are problems of strategy for the use of credits. It is often difficult to bring action to bear at one and the same time on structural reforms, orientation, the amount aid, etc. There is a noticeable tendency within the framework of existing legislation to disperse or "sprinkle" aid in view of the limitation of credits and the increase in potential beneficiaries, so that full assistance to those in real need is not always possible, the total amount remaining insufficient despite the increased allocations.

The delay in reforming aid systems may be put down either to the absence of research into the role and the results of student aid, or to policy reasons due to the difficulty of rescinding former legislation which favoured the social categories really benefiting from aid. The French fiscal example may be cited. The French Commission of State Aid to students noted: "From the fiscal point of view, as the student is considered as a dependent child until he is 25 years old and is included in the family's allowance for tax reduction, the aid system favours families with an average or high taxable income. This form of aid is paradoxical since it represents a loss for the State, without its providing supplementary aid for students from the more modest classes ..." (1). It seems that any far-reaching reform of the system to concentrate aid on students from the least favoured levels, would have to be done through measures that the present beneficiaries would be reluctant to accept. Apart from the fiscal example given above, decisions taken on a provisional basis cause situations to arise which make any attempt to concentrate an adequate amount of aid on less favoured students very difficult. A French example of the prior recruitment of certain teachers might be cited on this subject.

1. Provisional or definitive measures?

The situation in France leads us to ask what should be the duration of any measures taken to cope with a specific situation; for example, the lack of teachers as from 1955-1956 led to the setting up of preparatory institutes for secondary school teachers (I.P.E.S.).

It might be thought that the adoption of a system of direct or indirect aid to encourage advanced studies for children from the lower income groups would take on a definitive form, and would be incorporated into the structure of the educational system. Such a system should be designed with sufficient flexibility to allow for any modifications due to changes in the material situation of students. Thus, any increase in the incomes of certain social levels in receipt of aid for the continued education of their children should be declared immediately so that the amount can be reduced for the benefit of other students from the less favoured social groups. At the same time, if a student gets married or changes his address, he should be penalised as a result of the rigidity of the system for granting aid.

---

(1) Extract from the report of the Commission - "Le Monde" - 23rd-24th April, 1967.

But the rigidity of the system may also be expressed by the wish to cling to any "acquired rights" at all costs. When the rules are devised systematically to provide the most needy students with as much aid as possible, the question is one of structure. If a crisis in the recruitment of a given type of specialist arises, and a form of aid based on university criterion alone is designed to help meet it, the question is one of circumstance. The French I.P.E.S. is a typical example of a policy measure adapted to current problems "Pre-recruitment" by means of "pre-salary" similar to "pre-wages" on academic performance criteria alone may be imagined as part of a policy to obtain regular supplies of highly qualified specialists for the civil service who might be tempted, at the beginning of their career, to prefer the more remunerative private or para-public sector. But can the National Education services, which in most countries are rapidly becoming one of the largest employers, allow themselves to "pre-recruit" their future executives by granting special but indiscriminating aid? In France the aid to secondary school student-teachers (in the form of a pre-wage) represents nearly 70 per cent of the amount of the aid provided in the form of scholarships. Even if it is necessary to continue this aid for some time in view of the slow reaction of individuals and of the education system to provide the different types of highly qualified manpower temporarily in deficit, it must be recognised that the increase in staff in higher education in many European countries should make it possible to avoid institutionalising a costly measure and which, in general, is contrary to the principle of aiding those who really need it.

2. Priorities in allocating aid to students in different levels and types of education

The French example of I.P.E.S. was chosen because it clearly illustrates the danger of how a measure taken to meet a specific situation may be maintained as an acquired right. Some of the people who opposed this institution from the very start are now the first to defend it, although the number of students will increase very considerably, particularly in the Arts faculties, between now and 1972. In certain specialisations, the increase in the number of students and the lack of openings other than teaching may well result in a very tiring preparation for competitive examinations for student-professors with the right to a "pre-salary". However, it is clear that in France the major problem remains the faulty educational guidance given to students due to career choices made during secondary education. It is possible therefore to imagine, as a recent special commission has done (1) the maintenance of "the present distinction between scholarships for which the principal criteria is intellectual aptitude corrected by that of resources, and study grants for which the only criteria is intellectual aptitude". But, if aid is not to be reimbursed, that is, if the entire charge is to be borne by the community, it should certainly be effective and help those who really need it, or temporarily encourage the training of specialists in short support. If these conditions are not fulfilled, a paradoxical situation may arise, accentuated by the limited resources available for education at national level. On one side, there would be a small group of privileged students benefiting from a high level of aid and on the other a large number of students who, because of the inadequate level of scholarship grants, would find it necessary to eke out a precarious existence by taking work which might jeopardize their studies.

The Italian authorities have taken an important step forward by instituting, under the Act of 14th February, 1963, a study grant based at the same time on social and academic performance criteria. This type of aid is subject to a competitive examination and automatically covers the normal period of the course. The amount should correspond to the average cost of living for a student. Only students whose parents have an income less than the taxable minimum are eligible for the examination (2). Naturally, the percentage of recipients is relatively low: 2 per cent of registered students in 1962-1963, 4.1 per cent in 1963-1964 and 5.7 per cent in 1964-1965 (3). In 1970-1971 the Italian authorities hope to reach a percentage of 17 per cent (4). Some time must elapse before the effectiveness of this new measure can be judged; it is hoped that thorough research will bring to light both its usefulness and shortcomings. Mention has been made of the fact that Sweden has also attempted to analyse the implication of its aid to students. The Swedish measures are of interest inasmuch as the reform also covers aid granted to students attending the second cycle of secondary education.

---

(1) Commission d'études des problèmes de formation et de promotion sociale. February 1964 (Unpublished report).

(2) Conditions of admission of students to universities; financial aspects and problems of eligibility: Dehnkamp report - Fourth Conference of European Ministers of Education - London - April 1964.

(3) See: the Study on teachers "Training, Recruitment and Utilisation of Teachers in Primary and Secondary Education" Denmark-Italie-Luxembourg, O.E.C.D., 1968.

(4) Linee direttrice del piano di sviluppo pluriennale della scuola per il periodo successivo al 30 guigno 1965 - Ministry of Education - Rome.

In fact, the problem of priority in aid allotment does not arise only for a specific level of education. It seems to be increasingly clear, and the Swedish and French authorities have learned this by experience, that the key to democratising access to higher education is to be found in secondary education. Assuming that the problem of access to secondary education were solved at the level of the first cycle, it would be during the transfer to the second cycle and throughout the latter that aid should be kept up, but during this period a mechanism of observation and vocational guidance would have to be established similar to that used during the period of compulsory education.

Because of the present cost of direct aid in the form of pre-wages or pre-salaries for the higher educational level, it would certainly be very profitable to start off with some sort of vocational guidance for students. It might even be possible to consider a transfer of funds to this type of activity if policies for aid to higher education students were to be re-examined. "Vocational guidance services" could be included among the different bodies providing indirect aid to students or pupils. It seems therefore that a revision of different types of direct student aid (and of their amount) might take the form of some redistribution of funds for the benefit of indirect aid (at the same educational level or the one immediately below).

III. TYPE OF AID AND LEVEL OF EDUCATION: AN EXAMPLE OF THE CONVERGENCE OF PRINCIPLES AT THE BASIS OF STUDENT AID

The type or amount of direct aid may vary with the educational level and therefore with the age of the students. In fact, as the student's studies advance his expenditure changes: it changes in character and this may be due indirectly to the change in the form of his studies. For example, his expenses increase if after completing a first cycle in an establishment of higher education close to his home, he has to enrol in another which is farther away, in order to specialise. The scales for the different branches of study are therefore generally calculated according to the distance from home. Thus, the recent Italian Act (No. 80 of 14th February, 1963) creating study grants (on academic performance and social criteria) lays down a difference of L. 160,000 a year between the aid for a student living close to a university and that for one who is obliged to come to live in a university city.

In France the value of scholarships depends not only on the degree of dependence on the family and the family income, but also on the educational level: the value of scholarships varies according to three scales worked out on these lines. The following table gives the value of higher education scholarships in France from 1960 to 1964 according to the scales applied.

RATE OF HIGHER EDUCATION SCHOLARSHIPS IN FRANCE
ACCORDING TO THE SCALES FOR THE DIFFERENT
EDUCATIONAL LEVELS 1960 TO 1964

Year	Scale I	Scale II	Scale III	Post graduate
1960	1,600	1,800	2,100	3,750
1961	-	2,000	2,500	-
1962	-	-	-	-
1963	1,680	2,100	2,625	3,958
1964	1,848	2,310	2,888	4,332

Source: Le budget de l'étudiant. Recherches universitaires No. 6 - 1964.

The combined effect of an increase in aid as he progresses through school or university (hence age) and the specific character of certain types of study (usually final) can lead to a modification in the type of aid granted to a student.

Thus, in France, the need to expand the training of research workers in the faculties, (particularly in the science faculties) is combined with the fact that future research workers have already obtained their degree (having thus proved their capacity). They have therefore reached the age when the difficulty of paying for their education (involving for example the need to obtain paid work) might adversely affect the quality of this training, indispensable for the scientific progress of the nation. Thus the aid granted is no longer exactly a scholarship when one considers the criteria for its allotment or its amount (only academic performance criteria are considered, the social background of the student is not taken into account). The table above (4th column) shows clearly that the rate chosen, well above those in the highest scholarship scale, makes the student financially independent. The relative Fifth Plan Commission was of the opinion that at the post graduate level this grant should be made to every student not receiving another form of aid of a similar amount.

Up to now only direct aid has been discussed. In the French case dealt with above, indirect aid is also included for scholarship holders and students benefiting from post graduate study grants. On the other hand, when the amount, and above all the type, of direct aid reached the point where the beneficiary can be ranked as a salaried person, he pays for the different services which come under the heading of indirect aid at their real price. For example, in France, future teachers of secondary education during the pedagogical "stage", pay the real price for a meal at the university restaurant, because these student teachers receive an "advance salary".

The case quoted above is another example of the complete change in the type of direct aid given to students at the end of their education. Thus, as we shall see below, one of the characteristics of the recruitment of teachers in France is to link success in the examinations for recruiting teachers in State Schools (at different steps in their training) with financial aid, counting aid as actual salary, with a legal obligation to serve in the public service for a minimum number of years. Thus a student, whether scholarship holder or not during his graduate studies, who intends to become a secondary school teacher, is given a salary enabling him to continue his teacher training, immediately after he has passed the theoretical examinations for a teaching diploma in secondary education.(C.A.P.E.S).

The French example is nevertheless very specific to the extent that it is linked to new criteria for recruitment in the civil service.

On the other hand, France is planning, in the framework of the reform of higher education in science and arts, to develop the idea of allowing post-graduate students to teach the undergraduates. This is already being done in Sweden. The Fifth Plan Commission declared that it was "in favour" of students working if the salary was satisfactory and applied to students who had already graduated and especially if the job could be regarded as a complement to the student's academic work (1). The French Ministry of National Education is at present studying methods of applying this proposal, whose principles might eventually be of interest to other faculties or research organisations. In Sweden posts of "assistants" have been created for candidates for a doctorate and "deputies" for candidates for a degree or other diplomas. As in France these measures are at the same time an incentive to research, a solution to the teaching problem and an improved type of direct aid which takes into account the age of the students. The question is to arrange the time-table of these assistants so that they can continue normally with their studies or personel research (1). It is therefore becoming increasingly apparent, after examining the difference in the types of aid as the student progresses through the university, that student aid (principally direct aid) is based on a mixture of social, psychological and economic criteria, this latter raising the question of the neutrality of aid.

---

(1) Rapport Général de la commission de l'équipement scolaire, universitaire et sportif, Ve Plan, 1966-1970. Fifth Part: l'orientation et l'action sociale, p. 159.

IV. THE PROBLEM OF THE NEUTRALITY OF AID

A) What should be required of the student?

An increase in the number of students in the different types of higher education implies in general a more than proportional increase in aid, the newly enrolled students coming from the less favoured social groups. At the same time the community must meet priority demands for certain types of highly qualified manpower.

Should there be no counterpart to the acceptance by the community of responsibility for aid to students? Should the conditions be limited strictly to enabling a student to follow any type of study?

1. First, almost all countries require the student benefiting from aid to obtain his diplomas in the normal time. Failure to do so is usually penalised by the suppression or suspension of aid. Thus, in Sweden, any student applying for the current type of aid will receive it; proof of his ability to follow the course must be produced after the first six months, the service giving the aid (2) follows the student's career.

   The sanction mentioned here applies mainly to direct aid. All or part of indirect aid can be retained: for example, in France, a student losing a scholarship will continue to benefit from the low priced meals in the university restaurants just as his comrades who hold scholarships, until he passes a certain age which no longer allows him to benefit from "university services". We shall now examine the neutrality of direct aid bearing in mind the particular characteristics of indirect aid.

---

(1) In Sweden, these assistants give 1,000 hours of instruction a year.

(2) See Educational Policy and Planning - Sweden, "Student Welfare", Chapter 5, O.E.C.D., 1967.

2. Secondly, temporary or permanent rules may encourage students to choose a particular type of education. In the United States, for example, in sectors where there are shortages, such as science, more scholarships (or for higher amounts) have been offered since 1958. In Sweden, a measure such as equality of aid to students in any type of higher education tends to narrow the gap of social prestige between establishments and encourage more pupils to follow non-university higher education. In France, post graduate study grants are made entirely on the basis of academic performance with the object of increasing the number of research workers.

3. These two types of direct aid to students therefore have no direct influence on the future assignment of the graduate in the active (or possibly non-active) population. There is a third type of more generous aid, but which is accompanied by a legal obligation to work for a number of years for the authority granting it. This could be either a public authority: for example the civil service, and in particular the State educational services; or a private enterprise: a firm paying for the education of the executives it plans to employ. This formula therefore goes much farther than the simple inducement to increase, for example, the number of scientists by offering more scholarships. This aid policy is designed to ensure a regular flow of graduates who will be certain to enter a specific profession, generally the civil service. Such a measure is also of great importance when there is a situation of full employment for highly qualified staff. This policy is far from being unanimously adopted however, as can be seen by an examination of national regulations as evidenced by a comparison between France and Sweden.

B) French Policy

In France in 1963/1964 there were 20-22 per cent of students who were scholarship holders, and 8-10 per cent who had received other types of grants (or pre-salaries). This latter figure is very approximate, for the statistics show the pre-salaries under different headings, some being considered according to the regulations as actual salaries. If the different types of direct aid are added together, nearly one third of French students are shown to receive one or other type of direct aid, which puts France in its true place among European countries (1).

Apart from scholarships based on academic performance and social criteria, a considerable proportion of students receive direct aid at a higher level than that of the scholarship. Post-graduate grants have already been mentioned, but these do not entail any obligation to work for a given period.

We should therefore concentrate on the "pre-salaries" offered to students who undertake to serve the authority granting the aid. Under present conditions, it is not possible to ascertain the number of "pre-contracts" offered by private or semi-public firms, thereby operating a form of "pre-recruitment", particularly during a period of full employment of highly qualified manpower. This direct aid exists in other countries as well as France, but does not seem very widespread, at least in relative value, compared with what the community pays in the form of direct aid.

1) Pre-recruitment in the civil service

It is a tradition in France that part of the civil service senior staff be "pre-recruited". But in the "civil service group" teachers represent the majority (2). Candidates passing a recruitment examination undertake to serve the State for a set number of years (varying according to the job) or else must repay tuition fees and salaries received during the training period. In return, the student receives an amount which, whatever its specific character (depending on the recipient's future job), we shall call a "study grant". The term "pre-salary" has recently been adopted, but is too close to "salary". The different categories of students receiving study grants are in no way "salaried" however, although they are still generally regarded as such, and this is the reason they are not counted with other types of direct aid (scholarships, post-graduate grants or loans). It is therefore very difficult to isolate them statistically. These students are, like others of their comrades (scholarship holders or not, for example) undergoing training in specialised schools where the practical aspects of vocational training occupy a large place. In view of this, which is to the credit of these large specialised schools, these pupils cannot be regarded as already forming part of the working population.

---

(1) In studies dealing with this problem only scholarships are usually counted - see for example: F. Edding: "Student Aid" (Appendix Table V) in Financing of Education for Economic Growth, O.E.C.D. Paris, 1966.

(2) See for more detail the Study on Teachers, "The Training, Recruitment and Utilisation of Teachers in Primary and Secondary Education", France-Ireland, O.E.C.D., 1969.

This point should of course be reconsidered if some of the pupils at these centres are already working and are following refresher courses while still receiving their salary or, by means of a special indemnity, are in course of "reconversion".

France is not the only country to offer teachers in their final year of training (including pupil teaching) a large grant (corresponding more or less to the first step in the grade to which the beneficiary belongs). Sweden, for example, considers this as a "teacher's salary" (1). The "Inquiry Commission into State Education in Italy" recommended, some years ago, that the years spent in training by secondary school teachers after graduation be "considered as years of teaching service with the right to a slightly lower salary than that at which teachers start" (2).

France differs from these countries, however, concerning the type of aid described above, inasmuch as this aid is offered not at the end of the student's education, when he has decided on his profession, but at the beginning. For a large part of the primary school teachers, the choice of profession has to be made at the age of 15-16 years, and for a number of the secondary school teachers at the age of 18-19, at the end of the first year of higher education. Having passed his entry examination, the student undertakes to work for the State for a certain period (10 years after leaving training college for a primary teacher, 10 years including training institute time for upper secondary school teachers). The student's age is taken into account: the future primary teacher who from 16 to 18 does no more than attend a long secondary course under favourable conditions receives a "maintenance scholarship"; during the years of professional training (after baccalauréat) he receives a "salary". Thus, in France, study grants are not the only grants to include a legal obligation to work in the civil service, (as in this case). This led the "Commission on problems of training and upgrading schemes" (February 1964) to form the opinion that "scholarships ought to be a means of directing students in accordance with the openings which are offered and the needs of the plan". The value of the scholarships should therefore vary according to these factors. Two years later, this stand was again taken, with a slight difference, by the school, university and sports equipment commission (Vth Plan 1966-1970) which proposed that "the amount of the scholarship should vary according to educational level, the family's possibilities of contributing and, if necessary, the subjects chosen" (1). These quotations have the merit of frankly raising the problem of the neutrality of direct aid to students. Earlier rules created different categories of grants corresponding to particular situations. It is in the light of specific criteria such as those indicated above (to meet the plan's requirements, for example) that rules for the present and the future should be drawn up or judged.

---

(1) See the study "Training, Recruitment and Utilisation of Teachers in Primary and Secondary Education", Austria-Grèce-Sweden, in the series Study on Teachers, O.E.C.D., 1968.

(2) See the Study on Teachers series, Denmark-Italie-Luxembourg, O.E.C.D., 1968.

2) Conjunctural or structural measures?

It might be useful to find out whether the measures taken are the result of conjunctural or structural influence. But, because of the time needed for an educational system to react, the conjunctural and the structural implications overlap each other as a result of the faulty vocational guidance of graduates and therefore of the small enrolment in some specialisations. For example, secondary education no longer provides enough of the type of secondary-school graduate that the country needs, so that the (faculty) output of higher education is not big enough. In addition, as civil service salaries - particularly in a period of full-employment for highly qualified manpower - are not so attractive as those outside, (this is possibly an artificial situation for if educational output and vocational guidance were better, this sort of tension would not be so acute) the disadvantages are offset by pre-recruiting these civil servants. There is thus a regular flow of civil servants and teachers, for which there is some justification at times when the State cannot ensure adequate recruitment. However, this situation may well become one of structure if, at the same time, no solution is found to the problem of civil service salaries and if the teaching system is not reformed with a view, inter alia, to providing the Nation with sufficient numbers of highly skilled personnel. If this aid is incorporated into the educational system, the cost should be considered when judging the results. In the aggregate, study grants based on academic performance criteria alone might be envisaged under the Plan to rectify a temporary shortage of specialists. Is there any justification, however, if "this temporary situation is of long duration" because no solution had been found to the real problems (structural reform of secondary and higher education affecting the number and the quality of graduates)? Could this not be an excuse to avoid settling the question? Do we not run the risk, in wishing to ensure the costly regular recruitment of civil servants, of losing sight of the real purpose of student aid, which is to help the least favoured students who have the ability to continue their education. Certainly, from the State's point of view, it costs less to offer pre-recruitment study grants than to try to pay the same salaries for specialists as are paid in the private sector. The whole problem of incomes policy is concerned here. On the other hand, in Sweden, a different attitude, based on the student's right to choose his career, has been adopted from that of France.

---

(1) Report Vth Plan, page 161.

C) Swedish policy

The Swedish authorities, contrary to the French authorities are of the opinion that direct aid to students ought not legally to bind the student to any authority whatsoever when he leaves higher education. Every holder of a secondary school leaving certificate who wishes to go on to higher education can obtain direct aid if he applies for it, the only condition for its continuation being the passing of the various examinations in the normal time. This desire to offer direct aid to all students has resulted in the amount of aid in non-university higher establishments (1) being brought into line with that in the university. This measure may indirectly attract more students than previously to non-university higher education on the same footing, regardless of the subjects they wish to take (2).

---

(1) For example: nurses schools, teachers training colleges.

(2) See the Study on Teachers, Austria-Grèce -Sweden, O.E.C.D., 1968. The following phrase is found in the study: "... It is strongly held in Sweden, that the financial aid system should be neutral to educational policies and that it should not be an instrument for steering students into different professional training systems; ...".

D) Difficulties in appraising the results

In the absence of any clear strategy implying the setting up of a policy for the training, appointment and utilisation of highly qualified manpower, in Sweden or in France, it is difficult to compare the respective merits of the policies described above. During the past decade, these two countries have experienced a strong demand for highly qualified manpower, in which the proportion of teachers was extremely high. Whatever the value of the measures taken in France (compared with the "neutrality" of Sweden) there have been heavy shortages of graduates, in particular in the civil service (whether of teachers or not) where a large proportion of the study grants were accompanied by legal commitments to employment. But the measures taken in France have at least had the merit of maintaining a minimum flow of graduates into the civil service, including teaching. In Sweden, this period was characterised also by shortages of highly qualified manpower, especially in teaching. Was this shortage of teachers more or less perceptible than in France? Would an aid policy directing students towards certain types of studies have made it possible to reduce such a shortage? It is difficult to find an answer taking into account the specific nature of the educational systems and the attitude of students (or their families) in each country. When the problem reaches such a size, student aid policy can be only one factor in a policy aiming at producing the maximum number of the graduates needed by the Community. In the specific case of teaching requirements, in a "conjunctural crises of long duration", if it is wished to maintain strict equality concerning aid for higher education, the absence of any incentive must be compensated by some form of "pre-recruitment".

An incentive without legal obligation to accept a particular job does not seem very effective in the specific case of teaching. This is confirmed in Italy. Every year certain graduates of long secondary technical courses are offered scholarships to enable them to specialise as professors of technical or vocational education. Despite the inducement of early establishment after they leave college, by no means all the graduates end up in education, for there is no legal obligation to become a teacher in a State school.

It would be advisable therefore to look for other formulae such as the creation of higher education courses more specifically oriented towards the training of teachers, or an improvement in the career possibilities offered to the teacher. The needs of economic growth in under-developed or developing countries raise particular problems concerning the neutrality of student aid, for the national authorities may have to refuse aid to students wishing to enrol for purely "consumption" subjects or for those with no outlet.

In these countries, students and money are rare "resources" and it does not seem possible to subsidise students who wish to take subjects that are of no interest for the development of the country. On the other hand, developed countries are already encountering a flow of students in higher education who wish to acquire a general training without any intention of joining the active population. In certain periods also, students receive aid for courses providing no outlets. If the financial resources and the policy for employment and training of manpower in these countries are adequate, there is no reason to use aid policy as an instrument for the vocational guidance of students. But, in view of the development of their overall education system, how many of the so-called developed countries conform with these criteria?

CONCLUSION: HARMONISATION OF DIFFERENT TYPES OF AID

A deliberate attempt has been made in the preceding paragraphs to break down the main questions which can be raised concerning student aid policy. The different aspects of this problem had to be treated separately for, as can be seen by the use of back references and even of repetition, the present aid systems are based on a conglomeration of more or less obsolete principles. The amount of expenditure on student aid, although not very well known, since aid was previously the responsibility of semi-public or of private bodies, is rising each year and is becoming an increasingly heavy burden on the budget of the State (or of the local communities) which took over from the more or less private bodies in view of the increased number of beneficiaries. It seems that the growth in potential beneficiaries - a result of legislative measures which are no longer adapted to the growth of incomes - and budgetary constraints, have led or will lead a number of national authorities to revise their regulations and make a clear and synthetised approach to the problem. It should easily be possible to answer the questions: who receives aid? for what purpose? thanks to what means? It is increasingly apparent that student aid was not the only instrument for democratising access to education, thus avoiding waste of talent, and must be included in more exclusive reforms directed towards the structure, contents and style of education. Moreover, the fact that the financing of aid is now being transferred from semi-private or private bodies or from families, to the community must entail a reassessment of the harmonisation of different types of aid, more especially direct and indirect aid. The latter can be either selective (for example: it is impossible to lodge all students in student residences) or on a basis of equality (for example: all students up to a certain age mey use the university restaurant at special reduced prices). The benefits under the heading of indirect aid are generally provided either free of charge (medical attention), or at a reduced price. They are provided more rarely at actual cost. The increase in the price of services offered, and in the recipients, at a time of growing incomes gives rise to a reconsideration of the problem of co-ordinating direct and indirect aid. More people are now wondering if, with a view to clarifying the objectives and also the conditions for using different forms of aid, it would not be preferable for the student to pay the real operating costs of the organs providing the different types of indirect aid, including the renewal of equipment, even if this meant increasing the amount of direct aid to these categories of students to whom it has been decided to give large-scale direct aid. Various French commissions have recently raised this question. One of the questions submitted to a commission on student aid was the co-ordination of direct and indirect aid, either by allowing very cheap rates for scholarship holders in the restaurants and student residences, or by imposing normal prices and considerably increasing the scholarships of the poorer students. The latter suggestion was the one adopted by the Commission (1). For the most important sector of indirect aid (restaurants and student residences), the Commission proposes that the State retain responsibility only for construction costs and staff salaries. The logical consequence of thus harmonising aid is for the student to fill out a single "social file" to support his request for direct and/or indirect aid. The responsible decentralised administration would equally well grant or withdraw either form of aid. The report of the Special Commission of the Vth Plan (1966-1970) had, a year previously, given a slightly different answer. This Commission, which agreed to link up the different aspects of student aid, proposed that normal prices be charged in the student residences where, for various social and psychological reasons, it would not be desirable to admit only scholarship holders. On the other hand, the Commission was not in favour of increasing the price of meals in university restaurants, on the grounds that the subsidy now paid should be considered as general expenditure in the interests of health and welfare; it was naturally in favour of increasing direct aid to students whose resources were insufficient.

Some aspects of indirect aid bring up the question of the student's integration into society, and concern, for example, his residence while studying. The present revision of certain rules concerning direct aid is generally intended to make the student independent, or at least to reduce the difference, in his personal statute, between him and persons of the same age who are already working. But, in view of the increasing number of pupils, the rising cost of land in city centres and the difficulties of transport, students are still being encouraged to isolate themselves in the student residences. However comfortable the facilities offered may be - as in the American campus, for example - criticisms are being made against this policy on the grounds that it favours segregation from other population groups at the same time as some direct aid policies are trying to achieve the opposite result. The report of the Vth French Plan thus recommended that "the solution of the 'campus', isolated from the other population centres and itself constituting an autonomous centre, should be ruled out as far as possible". The solution, according to the Commission, should lie in building moderate sized student residences, for economic reasons, and in developing the idea of town lodgings for the older or married students. This latter idea is already being tried out in some French university towns. It should be remembered that the harmonisation of direct and indirect aid is not concerned only with costs. The French example has been quoted in some detail to illustrate one of the attempts now being made to harmonise the different types of student aid. But such a policy also pre-supposes a definite improvement in basic data. This is the first task which national authorities should tackle.

---

(1) See the summary of the proposals of the Commission set up to study State aid to students in "Le Monde" of 23-24th April, 1967.

Annex I

BIBLIOGRAPHY

GENERAL DATA

International Association for Educational and Vocational Information - I.A.E.V.I., Paris:
Social Aid to Education - record of the International Seminar, Madrid, 16th-18th October, 1957.
Social Aid to Students in the World.

Bowles, F., Access to Higher Education, Vol. I, UNESCO, Paris, 1964;

Dehnkamp, "Conditions of Student Admission to Universities, Financial Aspects and Problems of Eligibility", in Record of the Fourth Conference of European Ministers of Education, London, April, 1964.

Edding, F., "Student Aid", in Financing of Education for Economic Growth, O.E.C.D., Paris, 1966

Harris, S.E., "Student Financing Measures", in Financing of Education for Economic Growth, O.E.C.D., Paris, 1966.

Harris, S.E., "General Problems in Education and Manpower", Part I, in Economic Aspects of Higher Education, O.E.C.D., Paris, 1964.

Manual of Education Statistics, UNESCO, Paris, 1961.

Methods and Statistical Needs for Educational Planning, O.E.C.D. Paris, 1967, Chapter VI: "The Costs of Education - Methods and Analysis and Projection". Appendix: "Direct and Indirect Aid to Students".

The Training, Recruitment and Utilisation of Teachers in Primary and Secondary Education, Country Case-Studies in the series Study on Teachers, O.E.C.D., Paris, 1968-1969. Each of the monographs contains a statement on aid to student teachers during their studies.

FRANCE

Rapport général de la Commission de l'équipement scolaire, universitaire et sportif:
IIIrd Plan - aide indirecte (équipement) Part I, Section IV.
IVth Plan - aide indirecte (équipement) Part I, Chapter V.
Vth Plan - l'orientation et l'action sociale, Part V, Chapter II.

Informations Statistiques, supplément au No. 59, May, 1964, Part I - "L'évolution du budget de l'éducation nationale depuis 1952".

Institut National de la Statistique et des Etudes Economiques: "Coût et développement de l'enseignement en France" dans Etudes économiques, No. 3, 1958.

"Le budget de l'étudiant" dans Recherches universitaires, No.6, 1964.

"Le logement: pour une approche du problème" - Recherches universitaires, No. 6, 1963.

Chollet, J., "L'allocation d'études" dans 21/27, No. 9, November, 1964.

Union Nationale des Etudiants de France - Union des Grandes Ecoles, - L'allocation d'études, Paris.

Assemblée Nationale - Rapport de M. Becker, député, sur "Les propositions de loi No. 1278, 1282 et 1283 tendant à la création d'une allocation d'études en faveur des étudiants". Commission des Affaires Culturelles, Familiales et Sociales.

Commission d'étude sur "l'aide de l'Etat aux étudiants", summary of the conclusions in "Le Monde" of 23rd-24th April, 1967.

Ministère d'Etat chargé de la Réforme Administrative - Rapport de la Commission d'étude des problèmes de formation et de promotion sociale, Paris, 1964.

"Conditions de développement, de recrutement, de fonctionnement et de localisation des Grandes Ecoles", Recueil et Monographies, No. 47, la Documentation Française.

Study on Teachers series, *France-Ireland*, Chapter IV, Part I, O.E.C.D., Paris, 1969.

Note: Publications showing the components of the national budget, the opinion of the "Commission des affaires culturelles, familiales et sociales" of the Assemblée Nationale, the publication "informations statistiques" include some figures on aid to students.

BELGIUM

Laderrière, P., *Essai d'analyse du financement de l'enseignement universitaire en Belgique* - document series, Directorate for Scientific Affairs, O.E.C.D., 1964.

D'Hoogh, C., *Les étudiants de l'université libre de Bruxelles - Aspects socio-économiques du milieu en 1962*, Institut de Sociologie de l'université libre de Bruxelles, 1963.

Ministère de l'Education nationale et de la culture, "Rapport annuel du Fonds National des Etudes" in *Etudes et Documents*, No. 31, 1966.

CANADA

The Industrial Foundation on Education, *The Case for Increasing Student Aid*, Toronto, 1958.

UNITED STATES

Harris, S.E., "Higher Education: Resources and Finance (U.S.A.)" in *Economic Aspects of Higher Education*, O.E.C.D., Paris, 1964.

Vogelnik D., "A comparison between the Financing of Higher Education in the United States and Yugoslavia" in *Economic Aspects of Higher Education*, O.E.C.D., Paris, 1964.

UNITED KINGDOM

Grants to Students - Anderson Reports - Cmnd. 1051, London, 1960.

Committee on Higher Education, Higher Education, Appendix IV, "Administrative, Financial and Economic Aspects of Higher Education", H.M.S.O., 1963.

SWEDEN

Educational Policy and Planning - Sweden, "Student Welfare", O.E.C.D., Paris, 1967.

SWITZERLAND

Département fédéral de l'Intérieur, Rapport de la Commission fédérale d'experts pour l'étude d'une aide aux universités, Berne, 1964.

+

+ \+

Reference can also be made to the bibliographies annexed to the study on "Social Aid to Students in the World" (I.A.E.V.I.), and to the report on "Conditions of Student Admission to Universities - Financial Aspects and Problems of Eligibility" - Fourth Conference of European Ministers of Education.

ANNEX II

PERCENTAGE OF STUDENTS RECEIVING DIRECT AID IN SOME O.E.C.D. MEMBER COUNTRIES

Country	Data	Percentage	Form of aid	Source(1)
Austria	-	approx. 30	Various financial aids	Dehnkamp report
Belgium } university	1962-63	37	Public and private funds	Etude Laderrière
Belgium } non university	1964-65	47.12	Public scholarships	F.N.E. Report
Canada	1960-61	12	Scholarships	I.A.E.V.I.
Denmark	-	approx. 40	40% loans and 60% scholarships	Dehnkamp Report
France	1963-64	approx. 30	Various direct aids	Annex III
Germany	Summer 1963	23.7	Public funds	Dehnkamp report
Greece { "écoles normales",	1965-66	9.35	Scholarships	O.E.C.D. monograph } Teacher Study Series
Greece { universités - grandes écoles	1965-66	2.8	"	" " }
Ireland	1961-62	7	Scholarships of the Central and local authorities	Dehnkamp Report
Italy	1964-65	5.7	Educational grants	O.E.C.D. monograph, " "
Japan	1961	32	Loans	I.A.E.V.I.
Netherlands	1963	30	Scholarships and loans	Dehnkamp Report
Norway	1961	66.7	Loans (supplementary scholarships: 26 per cent of the students)	Dehnkamp Report
Spain	1963-64	4.4	Scholarships	I.A.E.V.I.
Sweden	1962-63	at least 50	Loans guaranteed by the State (in addition, 25% of the students receive interest-free loans and 20% scholarships)	Dehnkamp Report
Turkey	-	approx. 2.4	Scholarships only	I.A.E.V.I.
United Kingdom	1961-62	approx. 90	Scholarships	I.A.E.V.I.
Yugoslavia	1963-64	approx. 13	Scholarships	I.A.E.V.I.

(1) Refers to bibliography for detailed origin of the source.

Annex III

DIRECT AID TO STUDENTS IN FRANCE - AN ATTEMPT TO DETERMINE THE NUMBER OF BENEFICIARIES

Direct aid to students is frequently calculated simply as the percentage of scholarship holders in the total number of students (1). The figure of 21-22 per cent beneficiaries, in France, does not in fact represent the total number of the recipients of direct student aid. This percentage is calculated on an approximate total as there are a number of double registrations overlapping the faculties and post-secondary establishments not yet eliminated. Moreover, the recipients of "pre-salaries" should be added to these 21-22 per cent scholarship holders; the different categories of the former are set out below and include between 8 and 10 per cent of all students. In France, around 30 per cent of the students are therefore probably receiving direct aid, thus placing France at a fairly high level for recipients of direct aid. The number benefiting from loans is negligible. To the total for direct aid should be added the amounts distributed by the "Fonds de Solidarité Universitaire" representing emergency grants to needy students (see Table 14 bis of the study "Le Budget Etudiant"), but the percentage of beneficiaries cannot be added to that for scholarships or pre-wages, as the average amount granted to each beneficiary is extremely low.

DIFFERENT CATEGORIES OF PRE-WAGES

The 8 to 10 per cent in receipt of "pre-wages" represent widely different categories of students. The very great majority are future civil servants of which the majority will be teachers. Moreover, those receiving "pre-wages" undertake to work for the civil service for 5 or 10 years, on pain of having to refund the grant. In general, these students have the benefit of a civil service trainee status, that is, they are registered as established civil servants with the social security, and contribute to the pension fund, etc.

---

(1) See Table 15, "Le Budget de l'étudiant", quoted in the bibliography. See M. Edding, "Student Aid", quoted in the bibliography. See also "Conditions of Student Admission to Universities, Financial Aspects and Problems of Eligibility", Report of M. Dehnkamp, 4th Conference of European Ministers of Education, London, April, 1964.

The different categories of beneficiaries are therefore as follows:

a) STUDENTS INTENDING TO GO INTO THE CIVIL SERVICE

1. Student teachers

- Primary teachers:

Future teachers are recruited by examination at the end of the first part of secondary education (end of Class 3 (4th year), sometimes at the end of Class 2 (5th year), that is to say at the age of 15 or 16). They receive a maintenance allowance up to the end of their course in the county secondary level, teacher training school; this allowance covers nearly all their maintenance costs. They receive a "salary" during their year(s) of professional training after the baccalauréat (in addition to the students entering after the first part of secondary school there are also some who are recruited after the baccalauréat, these have to do two years of professional training, whereas those entering after the first part of secondary school do only one (1). For 1956, it was possible to show under the running costs for teacher training schools the amounts for direct and indirect student aid as a proportion of current costs (2). Civil service trainees undertake to work in the civil service for ten years after leaving school.

- Secondary school teachers (3)

Teachers in Modern secondary schools "collèges d'enseignement général" (C.E.G.: polyvalent establishments for the first part of secondary education offering "modern" subjects in almost all colleges - primary school teachers with at least one year of university higher education) with the same status during their two years' training after the baccalauréat as primary school teachers.

Future teachers in the "lycées" (grammar schools) (classics, modern and technical) and teacher training schools, after a year at a university (year of preliminary studies, art and science faculties) may pass a competitive examination for admission to a preparatory institute for secondary school teachers (I.P.E.S.). The student who is considered as a civil service trainee undertakes to serve in the civil service for a period of ten years, including his period of training. I.P.E.S. aims simply at helping the student to prepare his teaching degree and the competitive examination for the recruitment of teachers - this for three or four years - under the best conditions ("Certificat d'Aptitude au Professorat d'Enseignement Secondaire", C.A.P.E.S.; "Certificat d'Aptitude au Professorat d'Enseignement Technique", C.A.P.E.T.; "agrégation" limited to a set percentage of those attending I.P.E.S.) (1). Future lycée teachers do not all enter I.P.E.S.; some take a teaching degree with or without a scholarship; others enter the Ecoles Normales Supérieures after one, two or three years of preparation.

---

(1) See "Les élèves-maîtres", fascicule de documentation administrative, recueil pratique - SEVPEN, 13 rue du Four, Paris 6ème

(2) "Coût et Développement de l'Enseignement en France", Institut National de la Statistique et des Etudes Economiques, No. 3), Imprimerie Nationale, Presses Universitaires de France.

(3) And possibly teachers in higher education for students who have passed the "agrégation" examination, or who come from certain higher teacher-training colleges.

Students with a teaching degree and who have passed the C.A.P.E.S. or C.A.P.E.T. theoretical examinations (whether from I.P.E.S. or not) complete one year of professional training in a regional teachers' centre (C.P.R.); they have the title of "trainee teacher" and are paid a salary equal to the first step of established teachers.

After one to three years of study - with or without a scholarship - students may enter an Ecole Normale Supérieure (E.N.S.) where, for three or four years, they prepare for the secondary school teacher examination with a status similar to that of a civil service.

Future teachers in technical colleges (C.E.T. - "Enseignement technique et professionel court") are trained for a year in the "Ecoles Normales Nationales d'Apprentissage" (E.N.N.A.) where the salary and status regulations are similar to those in the categories quoted above.

2. Other categories of students

Salaries are also paid to future civil servants in branches other than teaching. Recipients attend establishments "d'enseignement technique supérieur" (higher technical education; some are also known as "Grandes Ecoles"). Nevertheless, it is difficult to calculate the exact number of recipients, either because the information concerning these students is insufficient or because only part of them intend to enter the civil service, and no statistics are available concerning them. The legal conditions for obtaining a salary are much the same as those for future teachers.

---

(1) See "Les I.P.E.S." dossiers documentaires, No. 51, March 1953, (série information) and dossiers documentaires, No. 54, June, 1963.

b) STUDENTS WHO DO NOT INTEND TO ENTER THE CIVIL SERVICE (1)

1. Post graduate grants: Post graduate higher education is intended for research. This grant depends solely on academic performance (and not on social criteria). The student retains his student status (student social security and therefore university restaurant, etc.), and as the relevant table shows, the average rate is appreciably higher than that of the average for the highest level of scholarships (the amount granted under this heading is shown in the budget along with scholarships).

2. Pre-contracts: a private or public firm may offer to pay the full costs of a student's education on condition that he undertakes to work for the firm for a fixed number of years after he leaves college. Unfortunately, statistics for this type of pre-wage do not exist.

The different categories of salary granted to students are comparable to real "pre-wages" with special legal conditions. (This aid, which is usually shown under "loans" or "scholarships", is not granted to similar categories of students in many countries). These different scales help meet the difficulties encountered by the State and public or private firms on the labour market (pre-salaries to future teachers, pre-contracts to future engineers) or to demands resulting from the expansion of scientific research (grants for post graduate study made on academic performance criteria). The following Table is an attempt to show the different categories of recipients of direct aid. The different known categories of aid are all distributed by public bodies depending on the central government. It is not possible to calculate the number of scholarships granted by municipalities or private organisations; neither is the number of pre-contracts known.

---

(1) Or, at least, not immediately.

Table 1. NUMBER OF STUDENTS RECEIVING THE DIFFERENT CATEGORIES OF DIRECT AID IN FRANCE (1963 - 1964)

Different categories of direct aid to higher education students	Number of recipients		
	Total		Per-centage
(1) SCHOLARSHIPS (1)	77,700		20.6
(2) LOANS (2)	2,731		0.7
(3) PRE-WAGES			
a) Students intending to enter the civil Service			
1. Student-teachers:			
- Primary school teachers(3)	7,540		1.9
- Secondary school teachers			
Teachers of C.E.G.(3)	4,928	19,392	5.1
I.P.E.S. (4)	8,288		
C.P.R. (5)	2,613		
E.N.S. (6)	2,485		
Vocational guidance(6)	289		
E.N.N.A. (6)	800		
2. Other categories of students	4,000		1.1
b) Students not entering the civil service			
- Post-graduate grants(1)	2,500		0.6
- Pre-contracts	?		?
Total number of student recipients(1)	113,863		30.0
Total number of students	378,000		100.0

Sources: (1) "Le Budget de l'Etudiant", op. cit. (Table 15); post graduate grants have been subtracted from the total number of scholarships; primary school student teachers have been added to the total number of students given in this study.

(2) Information provided by "Bourses et Oeuvres Sociales", 8 rue Tour des Dames, Paris 9ème.

Sources (cont.)

(3) Information given by the "Service Central des Statistiques et de la Conjoncture" of the Ministry of Education (not including 1,262 substitute teachers on a six months'training course). Among the 4,928 future C.E.G. teachers (Collège d'Enseignement Général), 2,102 retained their former salary.

(4) Information given by the Direction des Enseignements Supérieurs, Ministry of Education (I.P.E.S., Institut de Préparation à l'Enseignement du Second Degré).

(5) Informations Statistiques, No. 60-61, June, July 1964, (C.P.R., Centre Pédagogique Régional).

(6) Statistique des établissements d'enseignement supérieur et technique supérieur. Annexe statistique au feuillet documentaire. Bureau universitaire de Statistique et de Documentation scolaires et professionnelles (Nov. 1964) (E.N.S.: Ecole Normale Supérieure; E.N.N.A.: Ecole Normale Nationale d'Apprentissage).

REMARKS

About 150 of the vocational guidance students are teachers retaining their salary; teachers represented in fact 53 per cent of those graduating in recent years. See on this subject "l'orientation scolaire et professionnelle en France" Institut Pédagogique National, 1962, 29 rue d'Ulm, Paris 5ème.

The figure of 4,000 adopted for the other categories of students receiving a "pre-wage" tied to future employment in the civil service, is very approximate; about half of these recipients are registered at establishments under the Ministry of National Defence.

In 1966-1967 the Commission on State Aid to Students reached figures for certain types of direct and indirect aid, as follows:

- scholarships: F. 280 million (roughly 100,000 scholarships, of which one third are granted to students in the preparatory classes for the "grandes écoles", in the "grandes écoles", and in the sections for advanced technicians).

- salaries of I.P.E.S. and E.N.S. students: F. 135 million (I.P.E.S. pupils number about 13,000).
- increased family allowances: F. 100 million.
- tax relief: F. 100 million,
  that is, F. 675 million under the heading of direct aid (some items are missing).
- university restaurants: F. 90 million.
- student residences: F. 54 million.
- subsidy to student social security: F. 27 million,
  that is, F. 171 million under indirect aid (some items are missing, capital expenditures are not included).

LIST OF PARTICIPANTS

(Names marked with an asterisk refer to persons whose interventions have been reproduced in this publication).

LIST OF PARTICIPANTS(1)

GERMANY

Mr. Jensen, S.	Institut für Bildungsforschung in der Max-Planck Gesellschaft.

SPAIN

Miss Calavia, C.	Ministerio de Educacion Nacional - MADRID.

FRANCE

*M. Arnaud, P.	Directeur de la Promotion Sociale - GRENOBLE.
*M. Corpet, Y.	Conseil National du Patronat Français - PARIS.
*Mlle. Duthilh, C.	Ministère de l'Education Nationale - PARIS.
M. Eicher	Professeur à la Faculté des Sciences Economiques - DIJON.
M. Grais, B.	INSEE - PARIS.
M. Najah	Institut d'Economie Régionale - DIJON.
M. Praderie	INSEE - PARIS.
M. Salomon	Ministère de l'Education Nationale - PARIS.
*M. Vermot-Gauchy	INSEE - PARIS.
*Doyen Weil	Doyen de la Faculté des Sciences - Université de GRENOBLE.

ICELAND

Mr. Helgason, J.	University of Iceland - REYKJAVIK.

JAPAN

Mr. Okuda	Ministry of Education - TOKYO.

---

(1) Given in the order of the French version.

LUXEMBOURG

M. Schmit, M.	Ministère de l'Education Nationale - LUXEMBOURG.
M. Turpel, M.	Ministère de l'Education Nationale - LUXEMBOURG.

NETHERLANDS

Dr. Godefroy, J.	Commissie van Statistisch Onderzoek van de Academische Raad.
Mr.Laederman	Ministerie van Onderwijs en Wetenschappen - 's GRAVENHAGE.
Dr.Ligtvoet, Ch.W.	Ministerie van Onderwijs en Wetenschappen - 's GRAVENHAGE.
Mr.Mosterd, B.	Ministerie van Onderwijs en Wetenschappen - 's GRAVENHAGE.
* Mr.Ruiter, R.	Centraal-Planbureau - 's GRAVENHAGE
Mr.Sondag, J.M.A.	Ministerie van Onderwijs en Wetenschappen - 's GRAVENHAGE.
Dr. van den Engel, J.	Ministerie van Onderwijs en Wetenschappen - 's GRAVENHAGE.
Mr.van Gigch, A.	Ministerie van Onderwijs en Wetenschappen - 's GRAVENHAGE.
Mr. van Norden	Ministerie van Onderwijs en Wetenschappen - 's GRAVENHAGE.
Mr. van Seventer, C.W.	Ministerie van Onderwijs en Wetenschappen - 's GRAVENHAGE

PORTUGAL

M. Costa Garcia, M.	Gabinete de Estudos e Planeamento da Acção Educativa - LISBOA.
M. Machette, R.	Faculté de Droit - LISBOA.

UNITED KINGDOM

Miss Phillips, C.	The London School of Economics and Political Science - ALDWYCK-LONDON.
* Mr.Redfern, P.	Department of Education and Science - LONDON SW.1.

SWITZERLAND

M. Keller, M.	Premier secrétaire à l'Education - BERNE.

INTERNATIONAL ORGANISATIONS

M. Balbir	UNESCO - Higher Education Division - PARIS
M. Skorov	UNESCO - International Institute for Educational Planning - Paris

BELGIUM

*M. Grootjans, F.	Ministre de l'Education Nationale.

+ + +

M. Bajoit, S.	Université Catholique de LOUVAIN.
M. Benon, G.	Professeur au Centre Universitaire de l'Etat à MONS.
M. Bodart, L.	Centre Universitaire de l'Etat à MONS.
R.P. Bone, E.	Recteur des Facultés Universitaires Notre-Dame de la Paix à NAMUR.
*M. Bonte, A.	Université de l'Etat, GAND.
M. Bouckaert, J.	Recteur de l'Université de l'Etat à GAND.
M. Carlier, J.	Ministère de l'Education Nationale et de la Culture.
M. Carton, M.	Professeur au Centre Universitaire de l'Etat à MONS.
M. Cliquet, M.	Professeur aux Facultés Universitaires Saint-Ignace, ANVERS.
*M. Coetsier, L.	Professeur à l'Université de l'Etat à GAND.
M. Coetsier, P.	Université de l'Etat à GAND.
M. Cools, H.	Bureau de Programmation Economique.
M. Coulon, M.	Ministère de l'Education Nationale et de la Culture.
Mgr. Daelemans, A.	Directeur Général du Secrétariat National de l'Enseignement Catholique.
M. De Backer, H.	Centre Universitaire de l'Etat à ANVERS.
M. Debelle, J.	Université Catholique de LOUVAIN.
Mlle De Brouckère, J.	Professeur à l'Université Libre de BRUXELLES.
M. De Clerck, K.	Université de l'Etat à GAND.
M. Dejean, Ch.	Université Libre de BRUXELLES.
M. Deleeck, H.	Professeur aux Facultés Universitaires Saint Ignace, ANVERS.
M. Deloz, M.	Ministère de l'Education Nationale et de la Culture.
M. Demeulder, J.	Conseil National de la Politique Scientifique.
M. Deroo, J.	Ministère de l'Emploi et du Travail.
R.P. Dhanis, E.	Recteur des Facultés Universitaires Saint Ignace, ANVERS.

M. Dugardijn, M.A.	FABRIMETAL - BRUXELLES.
M. Durant, A.	Faculté Universitaire Catholique de MONS.
M. Grosjean, M.	Secrétaire Général de la Fondation Universitaire.
M. Henrotte, J.	Université Catholique de LOUVAIN.
M. Kint, G.	Centre d'Etudes des Problèmes Sociaux et Professionnels de la Technique - BRUXELLES.
M. Lefebvre, Y.	Ministère de l'Education Nationale et de la Culture.
M. Levarlet, H.	Secrétaire Général, Ministère de l'Education Nationale et de la Culture.
M. Luxen, J.L.	Université Catholique de LOUVAIN.
Dr. Massart, L.	Recteur du Centre Universitaire de l'Etat à ANVERS.
*M. Meulepas, E.	Université Catholique de LOUVAIN.
R.P. Raes, J.	Facultés Universitaires Notre-Dame de la Paix, NAMUR.
M. Raes, K.	Bureau de Programmation Economique.
M. Schobbens	Institut National de Statistique.
*Dr. Spaey, J.	Secrétaire Général du Conseil National de la Politique Scientifique.
M. Stenmans, A.	Conseil National de la Politique Scientifique.
M. Swaelen, E.	Conseil National de la Politique Scientifique.
M. Tjiam, H.	Université Catholique de LOUVAIN.
M. Van Mele, J.	Ministère de l'Education Nationale et de la Culture.
M. Van Straelen, R.	Professeur aux Facultés Universitaires Saint Ignace, ANVERS.
M. Van Swieten, R.	Commissaire du Gouvernement - Centre Universitaire de l'Etat à MONS.
M. Van Thielen	Université Catholique de LOUVAIN.
M. Van Waelvelde	Institut National de Statistique.
M. Verlinden	Ministère de l'Emploi et du Travail.
M. Verougstraete, W.	Université Libre de BRUXELLES.
M. Wieërs, L.	Université Catholique de LOUVAIN.

CENTRE PILOTE POUR L'ETUDE DES INVESTISSEMENTS DANS L'ENSEIGNEMENT

Ministère de l'Education Nationale et de la Culture
Bruxelles

M. Geens, V.	Directeur du Centre, Directeur Général de l'Enseignement Technique.
M. Capon, A.	Chargé de Recherches
M. Hermans de Heel,E.	Chargé de Recherches.
M. Remiche, B.	Chargé de Recherches.
M. Verzele, W.	Chargé de Recherches.

OECD SECRETARIAT

*Dr. King, A.	Directeur, Direction des Affaires Scientifiques.
*M. Debeauvais, M. ...	Conseiller auprès de la Direction des Affaires Scientifiques; Directeur Scientifique de la Session d'Etude.
Mr.Williams, G.......	Administrateur principal, Division des Affaires Scientifiques.
*M. Laderrière, P. ...	Administrateur, Division des Affaires Scientifiques.
M. Hecquet, I.	Administrateur, Division des Affaires Scientifiques.
Mme. Solliliage, M. .	Administrateur, Division des Affaires Scientifiques.
M. Cerych,L.	Consultant, Division des Affaires Scientifiques.